NEW ZEALAND
JOURNAL OF
Agriculture
APRIL - 1956

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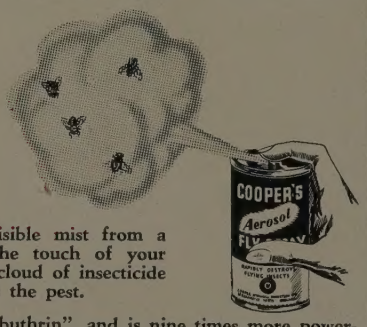

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Volume 92
Number 4
16 April
1956
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Rt. Hon. K. J. Holyoake,
Minister of Agriculture

This Month's Cover

A few years ago an unidentified disease was killing large numbers of stone fruit trees in various parts of New Zealand, particularly in Central Otago. It was found that the disease (blast) was caused by bacteria which cause similar diseases in a large number of hosts, including pears, citrus, roses, and rhododendrons. This month's cover, which is reproduced from a photograph by Tom Lloyd, shows a culture of bacteria being inoculated into a healthy peach tree at the Fruit Research Orchard of the Department of Scientific and Industrial Research at Earnscleugh. By this method bacteria isolated from diseased trees were tested for their ability to cause blast of stone fruit in healthy trees.

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The "Journal" is issued monthly. The subscription within New Zealand is 10s. a year; the overseas subscription is 13s. (sterling). The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available from Publications Section, P.O. Box 2298, Wellington, at 1s. a copy, post free.

Subscription inquiries (preferably accompanied by the address cut from a recent "Journal" wrapper) should be sent to the nearest office of the Department of Agriculture.

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE

Soviet Agriculture

By SIR PETER GREENWELL, Bart.

AGRICULTURE in Russia was observed by a British agricultural delegation of 26 members that spent a fortnight in the Soviet Union toward the end of last year. Impressions of the visit are described in this article adapted from a paper given by Sir Peter Greenwell, a member of the delegation, to the Farmers' Club in Britain. The New Zealand Minister of Agriculture, Mr. K. J. Holyoake, and the Director-General of Agriculture, Mr. E. J. Fawcett, on their way to the conference of the Food and Agriculture Organization in Rome, were in Moscow shortly after the British delegation's visit, but the nature of their official business and the level at which their discussions were held precluded their making a detailed study of the agricultural industry. Their impressions of agricultural developments formed during official visits shown in illustrations reproduced with the article accord with comments made by Sir Peter Greenwell.

Russia has been buying increasing quantities of New Zealand meat and butter in recent years and last year was the best market for our produce outside Britain. Occasional reports of spectacular research have hinted at the development of agriculture in Russia, whose history over many centuries has been closely identified with the tilling of the soil. The production, consumption, and population problems of modern Russia must be of interest to New Zealand farmers, whose surplus production enters so largely into world trade.

IT is a great honour to be invited to read a paper to the Farmers' Club. You usually invite people who are masters of their subject, but I am sure you will soon appreciate that I am not in that fortunate position. I hope that you will make allowances, knowing that the agricultural delegation to Russia spent only a fortnight in that vast country. We did not waste much time sleeping, but travelling, official receptions, banquets, and evenings at the opera and ballet, and a football match did take up time, as much as we enjoyed them.

I will be referring to money values and these present peculiar difficulties, because the official rate of 11 roubles to the pound is quite unrealistic and is best forgotten. In purchasing power of consumer goods the rouble is worth 5d. or for simplicity's sake, say, 50 to the pound. For producer goods, machinery, fertilisers, seeds, etc., 20 roubles to the pound is a convenient figure even if it is not

HEADING PHOTOGRAPH: During a visit to an agricultural research station in the Ukraine Mr. Holyoake and his party had an opportunity of seeing the Zimmenthal breed of dairy cattle, four bulls of which are shown. Next to Mr. Holyoake, who is on the left, is Mr. S. M. Sidorovich, Minister of Agriculture in the Republic of Ukraine.

strictly accurate. It is on this basis that I have converted roubles to our currency.

Russia has collective farms and State farms, roughly in the proportion of 6 collectives to 1 State farm. It seemed obvious that the State farms were more efficient and they are under direct control of the State, and would appear, politically, to be much more desirable.

The preponderance of collectives needs some explanation. It may be that the numerical strength of the peasants, who still form about half of the total population forced this compromise on the Government. The peasants undoubtedly welcomed the revolution as an opportunity to possess their land, but a peasant agriculture is not suited to providing food for a large and rising industrial population.

Organisation of Collectives

Collectivisation started about 1930, and since the war collectives have been amalgamated to form larger units. The party I was in visited collectives ranging from 3500 acres to 67,000 acres. The smallest one had a large area of grass, and the latter was in the virgin soil area and was changing from grazing to corn growing.

Members of collectives are expected to do a minimum amount of work on the collective, expressed in "labour units", which are piece-work norms laid down by the Board of the Collective for all the various jobs. The payment per labour unit is determined by the year's trading results of the farm, the surplus income, after payment of all outgoings and some taxes and making of certain allocations, being shared out according to the number of labour units worked. An advance payment is made and the balance when the results are known. We were told that 1½ to 2 labour units could be worked in a day, and 5s., 2 kilograms of grain, and 1 kilogram of potatoes were given as an example of the payment for a labour unit, but much lower and higher figures were quoted on various farms.

The collective is managed by a chairman and board who are elected, and the labour force is split up into brigades. We were told that 15 per cent. of income was allocated for capital improvements and 2 per cent. for cultural purposes.

Members have private plots of land limited to ½ to 2½ acres and are allowed to have 1 cow, 1 calf, 1 sow, etc. The limits vary according to districts, etc., but are never large.

All tractor work is done by the State organisation of machine tractor stations, which each serve a number of collectives. State farms are self-contained in this respect.

Produce from collectives is sold in various ways.

1. A fixed quantity has to be sold to the State at procurement prices, which are low.

2. Up to a further fixed amount has to be sold to the State at "over-quota" prices, which are higher.

3. Anything over these figures can be sold on the free market at still higher prices.

Meeting a Crucial Situation

Two years ago a crucial situation arose; targets were not being reached and output of livestock products was falling. We were told that it was not a crisis, but drastic actions were taken and I will detail these, as they do indicate some of the causes of the failure of the agricultural programme, and some of these still exist.

1. Prices were increased considerably. Procurement prices had been particularly low and one imagines that the payment per labour unit was so poor that many members cannot have been exactly enthusiastic about their work on the collectives. It was still apparent that the agricultural population was considered to merit lower standards than the town dwellers, but Russia is not alone in this attitude.

2. The minimum number of labour units to be worked by members of collectives was increased. On one farm we found that the minimum was 200 labour units and the average number worked was 350. I think it is fair to assume that the reward for a labour unit worked had probably been so low in the past that some members of collectives had done as little work on the collective as possible and probably spent too much time on their private plots. We were told on one farm that in 1951 a labour unit was rewarded by 3 roubles or 1s. 3d. and 2 kilograms of wheat, whereas in 1954 it had risen to 10½ roubles or 4s. 4½d. and 2 kilograms of wheat.

3. A grow-more-maize campaign was started. It was laid down that where possible the maize should be harvested as grain, and if it did not ripen, it was to be made into silage. There is no doubt that shortage of winter keep for livestock was, and is, a limiting factor, and though the maize will improve the position, some further steps to provide more protein will be necessary.

Lucerne appeared to be grown on a small scale and we were told that the acreage was to be increased. Maize was being made into silage when far too ripe, possibly being delayed in the hopes of being harvested as grain. Only 25 out of 400 acres of maize on a farm in the Moscow area had ripened sufficiently for harvesting the cobs and it had been a dry summer. In Kazakhstan we saw herds of cattle which will start the winter in very poor condition because of drought.

4. A vast plan to plough up 75,000,000 acres of virgin soil was set in motion and will be achieved in little more than 2 years. This will greatly increase wheat production and replace the grain grown on that part of the old lands which had been switched to maize.

One must give the Russians great credit for the way in which they have tackled this gigantic undertaking. Admittedly they are only at the beginning of the venture, but one got an idea of the magnitude of the task when one flew for hours on end over tracts of steppe land which appeared to be hundreds of miles from any habitation. But the land had been broken, some had grown wheat this year, and a lot more will be cropped for next harvest. It was not just one

Mr. Holyoake examining an exhibit of astrakhan at the U.S.S.R. Agricultural Exhibition. Second from the right is Mr. V. V. Matskevich, Minister of Agriculture of the U.S.S.R.

An exhibit of sheaves of wheat in the Ukrainian pavilion at the U.S.S.R. Agricultural Exhibition. This wheat was harvested in and sent from different parts of the Ukraine.

great field, for there always seemed to be bits which could not be ploughed, and the survey and planning must have been difficult enough.

The virgin soils we saw were good loams and full of root fibre and the soil texture was excellent. We were probably taken to one of the best areas. We thought we saw much lighter lands as we flew south toward Alma-ata, and wind erosion could do great damage to light land in that bleak country.

Rainfall, and that includes snow, was only 10in. and this is undoubtedly a limiting factor. This year there had been no rain from May until harvest.

The 1955 wheat yields were said to be 4cwt. per acre average in South Kazakhstan, but on virgin land 6cwt. In Northern Kazakhstan wheat yielded 6.4cwt. per acre on virgin soils. We were assured that next year this yield would be doubled "by using 'agro-biology' ".

The virgin soils were said to require no fertilisers in the initial years, but a little "down the spout" to get quick growth and cover of the land might well reduce loss of water by evaporation. Water was supplied by bores, but there was no question of there being sufficient for irrigation.

There had been an ambitious scheme in Stalin's time to expand production by irrigating large areas of land. This has been abandoned as being too slow and costly.

The finding of the men and machinery to cultivate the 75,000,000 acres, we gathered, was done in various ways. Some of the acreage was already grazing land of existing farms and was relatively easy to tackle. We did, however, hear that a machine tractor station was having to seed and harvest crops 300 miles away from its headquarters. Apparently some collective farms had off-hand grazing areas which are now being ploughed up.

Some new farms are being set up as State farms, and we visited one of 85,000 acres where a village had been almost completed in 14 months. Other lands had been ploughed, seeded, and harvested by brigades, which lived in tents and caravans, and presumably this will have to continue. One State farm of 1,000,000 acres was mentioned in the Press. Whether this will be subdivided as it becomes more intensive I do not know. It might be possible to continue such a set-up if dry farming methods were used, brigades camping out at seed time and harvest.

5. Machine tractor stations were given increased powers to direct the work of collectives. Chairmen of collectives sit on the board of their machine tractor station. Men with technical training are attached to the machine tractor stations and consist of agronomes (crop husbandry), zoo-technicals (animal husbandry), vets, and engineers, and this no doubt puts the managers of the machine tractor stations in a strong position, as of course they control all tractors and machinery that work on the collective farms.

We found evidence of a new policy allowing collectives to buy one or two small tractors and also of persuading the technically trained experts to become members of the collectives.

6. A large number of men (said to be 30,000) with administrative experience were released from the towns and were elected to posts of responsibility in the agricultural industry, such as the chairmanship of collectives.

Personally I was very impressed with the obvious ability of the men who were at the head of the collectives and the State farms. The size of the farms was so great that it was probably more important to have men who could administer and organise than to have men with technical qualifications as chairmen and managers.

7. The U.S.S.R. Agricultural Exhibition, just outside Moscow, must also be considered as a big effort to create enthusiasm in the task of increasing agricultural production. It is a most lavish spectacle and the theme throughout is always achievement by republics and by farms of increased production.

Difficulties Facing Russian Farming

Before criticising certain features of Russian farming I would like to mention some of the special difficulties facing the industry, some of which are political in origin.

Mr. Sidorovich and Mr. Holyoake discussing a maize crop on the Ukrainian agricultural research station the party visited.

Perhaps it would be true to say that the greatest difficulty facing the leaders of the agricultural industry in Russia has been the problem of changing the outlook of a backward peasant population and of creating enthusiasm and determination to make a success of their collective farms. Great improvements have been made in a short time, but there is still plenty of room for improvement. Most of the experienced farmers who resisted the changes imposed by the Communist Government ceased to be available to lead the industry.

Most of Russia's best farmland was devastated by war and fought over at least twice.

Rigid control by the State is considered essential. The collective farms have to be made dependent on the Government's machine tractor stations for all the main cultivations. The large size of the farms is also dictated by the need for ease of control.

Apart from the small private plots, private enterprise can play no part.

The political system seems to demand quick results. Agricultural development is a slow process normally, but in Russia vast changes are made in very short periods.

Mechanisation

Russia is fully mechanised regarding the main and heavier farming operations. The machinery, which is not unlike American products, is well made and often massively so. About half the tractors were tracklaying.

One gathered that the small 12 h.p. tractor with hydraulic lift which we saw at the exhibition was designed for a new phase in the programme of mechanisation. The new rule that some collectives may own one or two of these small tractors seems to show that attention is being paid to saving manpower on the lighter jobs. This tractor with its mounted equipment was said to cost 22,000 roubles —£1100 at the producer goods rate of exchange.

Large tractors had diesel engines, small ones petrol. Great efforts were made to load tractors fully. Hay rakes 50ft. wide and mowers consisting of five cutter bars of 6½ft. cut mounted on a tractor are examples.

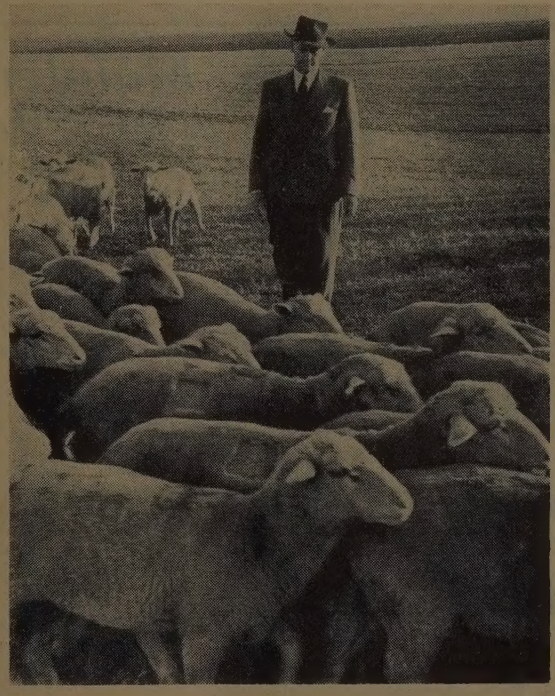
Trailer combines of 21ft. and smaller self-propelled models dealt with the grain harvest and farms were expected to harvest their corn in 10 days. The acreage harvested per machine was high by our standards, being about 500. The weight of corn harvested per machine was low, say, 150 tons.

One imagines that string is in short supply, because the straw was collected in large boxes towed behind the combines and dumped loose in large heaps.

One machine we saw was particularly impressive. It was a silage combine capable of cutting, chopping, and loading 2½ tons in 12 minutes. We saw it harvesting a crop of sorghum and it was doing good work.

The ploughing lacked finish, but weeds did not seem to be the problem they are in Britain and I doubt whether any bad effects resulted. One wondered whether poor plants of sugar beet we saw on irrigated land were the result of inadequate seed-bed preparation.

It was surprising to see very heavy repair machinery being installed in a



Ukrainian sheep being inspected by Mr. Holyoake on the agricultural research station he visited.

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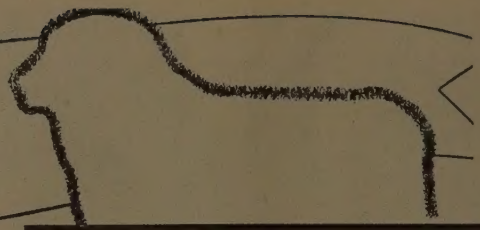

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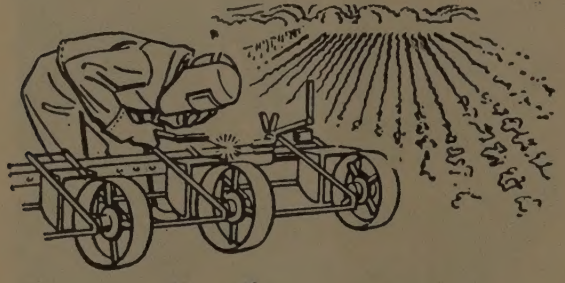

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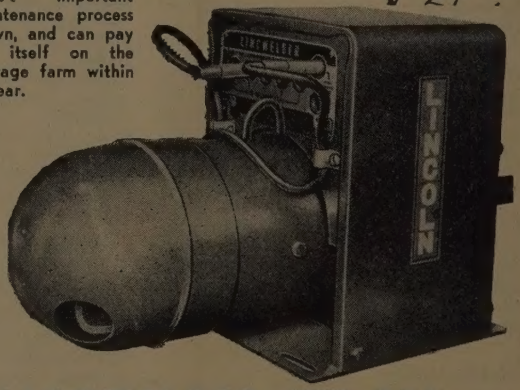

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The Ministerial party inspecting a byre on the Ukrainian agricultural research station. The principal milking breed is a dual-purpose one. The beef characteristics are evident.

new machine tractor station, but a verse in a humorous song making a joke of the spare-part position left us in no doubt that the spares situation was very bad. Figures for costs of repairs at a machine tractor station were very high and it points to machinery being kept beyond its economic life. The virgin soil policy has not made matters easier in this respect.

The Labour Force

Russia needs more workers in industry and of course in the virgin soil areas.

On the collective farms in the old lands we found a tremendous labour force, amounting frequently to 1 worker per 10 acres. This criticism has appeared a lot in the Press and I will not elaborate the point, but I would like to suggest that there are two factors which may help to reduce this excessive labour force, though perhaps not quickly enough for the authorities.

1. There is a drift from the land to the towns, where standards of housing, education, and amenities are higher.

2. As collectives increase their efficiency the payment per labour unit will rise and members may well be anxious to do more units of work each and will resist the entry of new members. Against this, one must appreciate that the chairmen and boards of the collectives will have a more difficult job without a large labour force to call on for rush periods.

The problem of attracting workers to the tough and bleak conditions of the virgin soil areas is a difficult one until communications and amenities are improved. We found that some workers there were recently released from the army in Austria, which was demobilised en bloc.

The general rather untidy appearance of collective farms may have been due to all work being piece work and the difficulty of getting the odd jobs done under that system.

We visited Russia during the last week in September and the first week in October, which was much too late for seeing most crops. When we visited a farm there was never enough time to hear all the facts about the farm at the headquarters and also to see all we wanted to out on the farm. One hopes that any future delegation may be given the opportunity to make a more intensive study of individual farms.

I hope you will bear in mind that my remarks which follow are based on very limited evidence.

Farm Buildings

We saw many new buildings under construction on farms. They were spaced far apart, making economy in labour difficult and using up more land than necessary. Possibly the long Russian winter and heavy snowfall may make this practice necessary. Timber was usually the material used, though mud blocks were used in treeless areas.

We found that sheep were housed during the winter, though they were out by day when the weather permitted.

Crops

Quantities of fertilisers applied were low by our standard, though there were a few specific examples given which would have been considered adequate and which did produce yields approaching our average. There is a theory held by some Russian scientists that a small quantity of inorganic and organic manures when applied together produce results comparable with a full fertiliser application. There may be some connection between this theory and the shortage of fertilisers.

Rotation tended to be exhaustive, and short of a big increase of temporary grass and livestock, there seemed to be no obvious way of improving crops.

Some plants of sugar beet we saw might have been the result of inadequate seed-bed preparation, and one

wondered whether a small tractor force under the direct control of the collective farm would not achieve a higher standard of cultivation.

Average yields of crops are low; wheat is said to yield 6cwt. and potatoes 3½ tons per acre. We undoubtedly were shown the better farms. We were told of yields near the average of this country for normal years, but lack of rain had caused much reduced crops in 1955.

Livestock

Cattle

There appeared to be many breeds of cattle and though there were herds of Friesians with 1000 gallon yields. the country's average is said to be 300 gallons. Though their cattle can survive the long winter on a low nutritional scale, one wonders whether they are genetically capable of high yields. The practice of milking low-yielding cows three times a day is difficult to understand.

We visited one farm where the herd average had been increased from 110 gallons in 1951 to 286 gallons in 1954, which is a reflection on the standard of management in 1951. The Russians lay great stress on percentage increases in production and such matters as udder conformation are relatively neglected.

Attempts are being made to enlarge A.I. stations and to improve the method of selecting bulls. I doubt whether they have yet reached the stage where a conscious choice has to be made between milk or beef, but milk yield would appear to be the quality most in need of improvement and this can be achieved without at least losing fleshing qualities.

Improvement of winter rations must have a considerable effect on production.

Pigs

We were shown pigs of Large White type which lacked length and were very fat, but we were told that this type suited requirements.

Very high figures of pigs weaned per sow per year were quoted, up to 22. This was achieved by delaying the first mating of gilts and by having one attendant to about three sows. Piglets were removed as they were born and kept away from the sow until she had finished farrowing.

Sheep

Wool was the main product from sheep and one gathered that wool was in short supply.

A.I. for sheep had been reduced to a simple routine on farms. Ram lambs were progeny tested by natural mating in their first year. The rams which had produced the best results were used for A.I. during their second and subsequent seasons. One ram could be used on 200 ewes and the percentage of barren ewes had been reduced from 25 per cent. to 2 per cent. by use of A.I. We did not discover why there had been such a high percentage of barren ewes when they were naturally mated.

A flock of 3000 ewes had produced 23 lambs per score this year.

The farm had its own A.I. station, and semen was collected as required, no attempt being made to store it even overnight. Two inseminations were given 12 to 24 hours apart.

Importations of livestock could certainly speed up the improvement of Russia's herds. The theory of "the inheritance of acquired characters" was quoted as an argument in favour of relying on stock bred in Russia.

Admittedly there are herds, mainly on State farms, which are well above the average of the country and which can improve the general standard.

Russia needs to increase the numbers of livestock also and it is more difficult to improve quality when numbers are expanding. Importation would seem to be an obvious step to hasten the livestock programme.

Education

Education between 7 and 14 years of age is general and education between 7 and 17 years of age is becoming general in the towns. We visited the Timiryazev Academy, where 5-year university courses are given to agricultural students numbering 4000, two-thirds being theoretical work and one-third practical work. This is one of the leading institutions for agricultural learning, of which there are 108.

Apart from direct requests for information from individual farms and machine tractor stations, the results of research work and experiments, we were told, reached the industry through the central Government.

Russia takes education very seriously and an increase in the number of people with technical training in the industry will undoubtedly give good results. It appears that there are now sufficient trained people for collectives to have some of their own technically trained men.

To sum up, agriculture in Russia now enjoys a much higher priority than it did previously. The strenuous and drastic actions taken to increase production will undoubtedly achieve results. The population of 210,000,000, which increases by 3,000,000 a year, can absorb any likely increase in animal products.

The success of the virgin soil programme may be uncertain, but in years of above-average rainfall one must expect a large grain surplus and the impact on the world's grain market will be considerable in those years.

Russian agriculture has great tasks ahead and there is ample scope for improvement, but wherever we went we found pride in what had already been achieved and obvious enthusiasm to do better.

We were received with great hospitality and friendliness, and constructive criticism was clearly welcomed by those in authority. We were constantly assured of the Russian desire for peace.

Meteorological Records for February

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	67.6	+ 2.0	81.5	47.6	8.10	14	+ 3.93	3.49	2	170
Auckland	160	69.2	+ 2.5	80.7	56.2	5.19	11	+ 1.28	1.66	3	190
Tauranga	10	66.7	+ 2.7	78.0	49.2	5.75	10	+ 2.02	3.40	4	184
Ruakura	131	65.0	+ 1.7	83.4	43.2	2.01	9	— 1.07	1.02	4	177
Rotorua	975	64.6	+ 1.7	82.8	45.1	1.85	9	— 1.90	1.06	4	173
Gisborne	12	65.8	+ 0.7	86.8	47.0	3.37	12	+ 0.32	1.15	17	209
New Plymouth ..	160	64.7	+ 2.2	80.0	49.8	5.60	10	+ 1.62	2.71	28	171
Kariol	2125	59.4	+ 1.8	78.2	36.7	3.55	9	— 0.50	1.08	16	
Napier	5	65.7	+ 0.3	86.7	48.5	1.90	6	— 0.78	0.86	17	186
Wanganui	72	66.1	+ 2.4	83.1	48.2	4.31	9	+ 1.34	2.13	28	182
Palmerston North .	110	64.4	+ 1.9	83.0	46.2	2.25	11	— 0.84	0.93	28	156
Waingawa	340	63.5	+ 1.1	85.0	41.0	2.75	8	— 0.06	1.31	28	175
Wellington	45	62.2	+ 0.9	75.1	47.5	1.79	8	— 1.49	0.75	16	154
Nelson airfield ..	5	62.9	+ 1.7	74.9	48.6	1.20	7	— 1.42	0.55	16	214
Blenheim	12	64.0	+ 1.2	84.0	41.4	1.02	5	— 1.12	0.56	16	211
Hokitika	15	60.7	+ 2.6	77.6	46.4	2.72	9	— 5.01	0.87	12	214
Hanmer	1270	61.2	+ 1.8	88.0	36.6	1.09	8	— 2.56	0.52	16	162
Christchurch ..	22	62.1	+ 1.3	94.7	41.8	1.38	5	— 0.42	0.97	6	173
Ashburton	323	63.1	+ 2.1	94.2	40.8	0.80	7	— 1.89	0.29	16	167
Timaru	56	61.8	+ 1.6	95.2	43.0	1.00	9	— 1.22	0.26	19	166
Alexandra	520	62.9	+ 1.5	89.5	42.0	0.24	5	— 1.23	0.16	19	203
Taieri	80	58.2	+ 0.5	84.9	36.6	0.80	11	— 1.51	0.24	19	184
Invercargill airfield	0	55.8	— 0.4	75.7	34.3	4.79	14	+ 1.44	1.16	5	168
Chatham Islands ..	140	57.3	— 1.1	69.8	44.2	2.25	12	— 0.14	0.68	6	

Seventh Laying Trial of Prospective Poultry Breeding Stock

THE seventh breeders' laying trial held at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, started on 21 February 1955 and ended 48 weeks later on 22 January 1956. Thirty pens were entered in Section A, for pens of 20 pullets, and 8 pens in Section B, for pens of 10 pullets. Section B is intended for poultry producers owning flocks of 200 birds or fewer. The 38 pens contained a total of 680 pullets, the largest number of birds so far entered for the trial. The seventh laying trial was highly successful and in this article a full report on it is given by F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington, and J. Edmondson, Poultry Experimentalist, Department of Agriculture, Upper Hutt.

VARIOUS breeds were represented in the 1955-56 trial as follows:—

Breed	No. of pullets	
Australorps	400	(Sec. A, 19 pens; Sec. B, 2 pens)
White Leghorns	140	(Sec. A, 7 pens)
Rhode Island Reds	90	(Sec. A, 4 pens; Sec. B, 1 pen)
Black Orpingtons	20	(Sec. B, 2 pens)
Barred Rocks	20	(Sec. B, 2 pens)
North Holland Blues	10	(Sec. B, 1 pen)

As compared with the previous trial there was a marked increase in Australorps, a decrease in White Leghorns, and an increase of 50 in Rhode Island Reds. Nearly all the birds were in good condition on arrival and began excellently as is shown by the figures on egg production given later in this report.

Management

Two important changes were made in the management of the birds in this trial. Artificial lighting during late autumn and winter was introduced for the first time. This was considered an improvement in management of the birds in view of the climate in winter in the Hutt Valley and the siting of the houses used for the trial. The houses do not get the maximum amount of available sunshine, particularly during winter.

Because of the first change in management it was desirable to introduce the second. This was the feeding of dry mash and grain in place of wet mash and grain as in previous years. Dry mash was available to the birds throughout the week with the normal two feeds of grain daily. Previously the birds received wet mash on 6 days of the week with two feeds of grain daily. On Sundays they received no mash, but a double feed of grain.

Apart from the two changes mentioned management and feeding have been similar to those in previous trials. The mash fed was based on the following formula:—

	lb.
Bran	22
Pollard	20
Wheat meal	24
Ground oats	7
Maize meal	10
Meat meal (58 per cent. protein)	15
Common salt	1
Ground limestone or oyster shell dust	1
	100

Fish oil containing 2000 units of vitamin A and 200 units of vitamin D per gramme of oil was added to the mash at ¾ pint per 100lb. of mash. In addition the pullets received a daily ration of greenfeed.

HEADING PHOTOGRAPH: Checking, weighing, and assessing the value of pullets as possible future breeding birds at the end of the trial.

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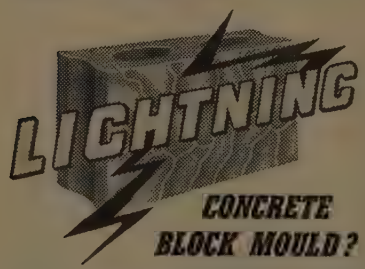

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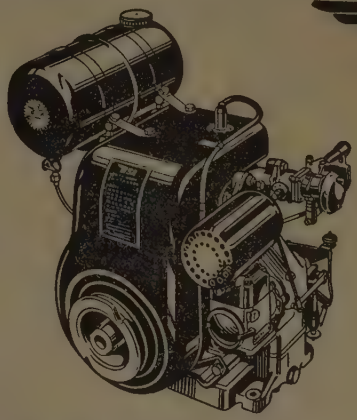

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Breeder and pen number	WEIGHT (In pounds) OF EACH BIRD AT END OF TRIAL AND 48 WEEKS' PRODUCTION OF EACH BIRD																	Total for pen (including floor eggs)	Flock-housed average per pen
SECTION A: 20 PULLETS																			
Australorps (Minimum weight 6lb.)																			
Burd, A. E. (14)	6.3	8.3	6.7	8.0	8.2	5.8	6.4	8.7	7.7	7.0	7.9	7.3	7.1	6.4	7.4	7.2	5.1	6.7	7.4	6.0	
	242	215	197	206	232	238	256	247	196	180	216	227	183	214	238	231	186	48	148	164	4,079	203.9
Coman, F. J. (9)	6.6	6.9	8.3	7.0	7.4	7.4	7.1	7.0	7.3	7.1	7.6	8.1	6.8	6.2	7.8	8.4	8.4	8.4	9.3	—		
	249	262	193	225	224	200	217	259	253	259	245	217	189	228	258	222	118	4	143	—	3,994	199.7
Jorey, G. E. (13)	6.0	6.4	8.1	6.6	6.6	6.0	6.6	6.4	6.5	6.5	6.0	6.8	6.9	6.3	6.9	5.0	7.5	6.0	6.9	5.4		
	254	207	185	238	233	233	187	233	262	220	221	181	226	252	194*	219	114	171	143	235	4,230	211.5
Phare, J. R.	6.9	8.0	7.8	6.6	6.0	6.1	6.6	7.4	7.4	8.2	6.6	6.4	6.5	6.4	5.3	5.6	7.0	5.7	6.6	—		
(10)	246	188	208	188	239	234	239	182	190	237	228	188	228	210	130	239	133	252	91	—	3,877	193.8
Smith, A. J. (12)	7.4	7.1	7.6	8.3	7.2	7.4	9.1	7.7	6.5	8.0	8.2	7.0	6.0	6.4	6.7	8.0	8.2	—	—	—		
	181	240	260	238	195	214	205	224	231	266	222	261	200	245	171	132	109	—	—	—	4,109	205.4
Bagley and Sons	6.5	7.1	6.3	7.4	6.6	7.6	6.7	7.2	6.7	7.1	7.4	7.4	7.4	5.2	10.4	7.4	6.2	8.0	8.2	—		
(7)	219	270	236	220	212	240	243	215	220	237	271	194	214	191	159	174	199	157	155	—	4,105	205.2
Willers, R. (2)	8.3	6.5	8.2	6.0	6.6	6.2	7.2	8.2	7.9	7.3	6.1	7.7	7.5	6.0	—	4.8	8.1	5.8	—	—		
	250	246	245	227	251	248	257	278	245	252	243	265	253	223	257	119	161	223	—	—	4,514	225.7
Gilmore, J. P.	7.5	8.0	7.9	7.6	7.8	8.0	7.3	9.0	7.1	6.8	7.8	6.4	7.7	5.9	6.5	7.7	—	—	—	—		
(15)	238	207	288	242	249	256	208	260	235	194	182	224	71	236	88	157	—	—	—	—	3,565	178.7
King, A. E. (16)	6.7	7.0	7.3	6.8	7.1	6.3	6.4	6.5	7.1	7.6	7.9	6.0	5.9	6.6	6.6	7.1	6.5	9.2	—	—		
	251	266	240	202	263	277	210	200	244	279	203	276	88	136	117	157	142	95	—	—	3,886	194.3
C. Walker and	5.8	6.5	6.9	6.6	7.2	6.6	6.8	7.3	6.4	7.1	6.2	7.3	5.7	5.7	6.4	5.7	5.5	7.1	6.0	7.0		
Sons (4)	211	201	200	185	207	230	252	243	232	243	230	185	261	242	110	254	263	127	171	164	4,240	212.0
Greendale Poultry	8.2	7.0	6.8	8.8	6.3	6.1	6.6	7.3	6.2	6.8	6.9	8.3	6.9	7.2	8.6	9.0	5.6	5.4	—	—		
Farm (5)	230	238	232	222	262	273	265	238	262	280	239	97	255*	45	163	166	155	279	—	—	4,263	213.1
Siddall and Son	6.6	6.5	7.2	7.9	7.0	7.7	7.9	7.1	6.2	7.2	7.6	6.6	7.7	6.4	7.8	6.3	7.6	6.3	8.9	5.6		
(1)	245	229	205	240	197	185	222	214	206	252	244	144	147	85	170	174	179	173*	81	214	3,836	191.8
Poultry Demonstra-	6.2	6.2	7.7	6.6	7.1	6.6	7.2	8.2	6.5	8.1	7.0	5.7	8.0	8.3	7.2	6.1	6.6	7.3	5.3	—		
tion Plant (18)	196	211	249	217	239	201	227	232	191	270	133	253	33	138	45	84	7	144	250	—	3,448	172.4
Rasmusen, M. A.	6.0	6.7	6.8	6.7	7.0	8.0	6.0	6.4	6.2	6.8	5.2	5.2	7.1	6.9	6.0	6.2	5.4	6.9	7.5	6.6		
(3)	225	218	225	235	196	236	241	188	238	218	236	216	244	150	151	167	209	169	146	119	4,055	202.7
Bedford, L. G.	7.9	6.0	6.8	6.2	6.2	6.5	6.3	6.2	5.8	5.4	6.0	5.6	5.5	5.6	5.1	5.1	6.8	—	—	—		
(11)	197	239	225	213	193	203	245	229	250	261	165	183	218	261	226	188	155	—	—	—	3,876	193.8
Harrex's Poultry	7.6	7.8	6.0	6.1	6.9	5.8	7.3	7.2	6.4	5.0	5.6	5.4	6.9	7.0	8.7	—	—	—	—	—		
Farm (17)	257	279	262	192	206	184	254	254	175	242	159	183	100	177	118	—	—	—	—	—	3,698	184.9
Bilton, R. E. (6)	7.4	7.1	6.7	6.4	6.7	6.2	5.8	5.6	6.6	7.3	5.2	5.2	5.0	6.7	5.2	6.0	—	—	—	—		
	246	272	238	276	232	226	253	240	175	179	194	78	233	110	132	176	—	—	—	—	3,705	185.2
Smith, G. L. A.	6.2	8.4	7.2	7.8	6.4	7.4	7.7	4.4	7.9	5.8	5.7	5.7	5.4	5.5	—	—	—	—	—	—		
(8)	264	202	248	212	239	281	86	84	167	257	47	248	228	203	—	—	—	—	—	—	3,244	162.2
Pen No. 19	6.4	6.4	6.0	6.4	6.0	5.8	4.9	5.0	5.3	5.6	7.7	5.4	7.2	5.2	5.3	4.7	4.6	—	—	—		
	243	225	200	182	228	185	204	136*	233	215*	152	235	167	236*	224	151	265*	—	—	—	3,715	185.7
Rhode Island Reds (Minimum weight 6lb.)																			
Vincent, R. H.	6.9	7.6	6.7	7.5	7.5	7.5	6.0	6.1	6.8	6.8	6.0	6.6	6.6	7.9	7.3	6.4	8.1	5.8	5.8	7.6		
(20)	264	229	293	275	249	242	252	271	267	278	257	228	246	239	261	291	21	31	241	37	4,566	228.3
Bagley and Sons	6.4	7.4	6.4	7.8	7.2	7.0	4.7	5.7	5.1	4.9	5.9	5.6	5.6	6.9	5.7	5.0	7.8	7.0	—	—		
(22)	272	230	215	207	195	250	222	204	180	183	136	189	171	174	259	244	141	25	—	—	3,620	181.0
Bromley Park	7.3	6.6	6.1	6.3	6.2	7.0	5.5	4.6	5.6	7.7	6.2	4.8	5.0	—	—	—	—	—	—	—		
Ltd. (23)	252	232	232	280	258	233	43	250	220	176	108	271	193	—	—	—	—	—	—	—	3,479	173.9
Craig, L. W. (21)	6.2	6.3	6.2	6.0	8.0	6.4	4.4	6.0	6.0	5.1	5.7	5.5	5.3	5.3	4.8	5.5	—	—	—	—		
	257	238	231	272	214	273*	213	212*	296*	206	220	249	265	243	175	245*	—	—	—	—	4,266	213.3
White Leghorns (Minimum weight 4½lb.)																			
Jorey, G. E. (25)	5.8	6.4	5.2	5.4	5.1	5.7	5.0	5.4	5.7	4.8	6.4	5.2	5.0	4.8	5.0	6.5	4.3	4.4	5.1	6.0		
	213	231	229	206	211	225	185	245	233	212	234	223	274	244	248	218	259	190	159	174	4,424	221.2
Salisbury's Ltd.	5.2	5.2	5.2	5.4	5.3	5.9	5.2	5.7	4.9	6.2	5.3	5.2	5.9	5.4	5.5	6.0	5.8	5.3	—	—		
(26)	197	215	220	206	201	217	219	210	227	209	248	235	229	204	250	120	122	161	—	—	3,827	191.3
Ching, V. P. (27)	5.8	5.9	5.9	5.7	6.2	5.1	4.9	5.8	5.2	6.5	5.3	5.6	6.1	5.5	6.2	5.7	5.8	5.2	5.9	6.0		
	254	205	221	216	206	210	250	206	236	203	238	220	202	272	148	210	184	171	194	27	4,081	204.0
C. Walker and	4.9	5.6	5.1	4.8	5.5	5.3	5.7	4.7	5.3	5.1	5.4	5.0	4.9	4.5	5.6	4.5	4.9	6.1	—	—		
Sons (24)	254	183	237	230	214	225	229	207	213	223	219	229	248	212	153	219	204	172	—	—	3,928	196.4
Grigg, J. W. (29)	5.0	5.4	6.1	5.4	5.5	5.4	5.5	7.1	4.9	6.4	5.7	6.0	5.9	5.9	5.5	5.2	5.4	4.6	—	—		
	253	219	251	201	186	195	241	220	234	199	278	134	177	126	87	130	150	195	—	—	3,631	181.5
Pen No. 28	6.1	5.2	5.3	4.7	5.4	5.4	4.7	5.5	4.4	5.2	5.0	6.0	5.7	4.7	4.8	4.4	4.3	—	—	—		
	223	186	202	212	215	218	208	175	250	177	179	157	156	167	225	259	264	—	—	—	3,696	184.8
Linwood Poultry	5.3	5.8	4.7	5.5	5.0	4.5	5.2	4.9	4.1	5.3	5.7	5.5	5.2	4.8	3.8	4.3	5.5	—	—	—		
Farm (30)	229	183	206	200	234	175	135	100	208	180	107	170	163	141	234	190	163	—	—	—	3,162	158.1
SECTION B: 10 PULLETS																			
Australorps (Minimum weight 6lb.)																			
Drummond, Mrs.	7.6	8.4	6.1	6.7	7.4	6.6	7.9	7.2	5.2	5.3												
C. A. (32)	216	201	253	210	155	165	167	120	247	237											1,974	197.4
McKie, S. N.	6.8	7.4	6.5	6.9	7.4	6.6	6.2	8.2	5.7	8.0												
(31)	239	195	186	232	239	214	202	233	291	123											2,153	215.3
Black Orpingtons (Minimum weight 6½lb.)																			
Dudding, E. C.	7.5	7.2	6.6	6.6	7.0	6.5	6.1	6.3	6.3	—												
(34)	211	219	249	227	253	222	234	267	217	—											2,155	215.5
Morris, J. H.	7.2	6.2	4.9	4.7	4.8	5.0	4.3	—	—	—												
(35)	214	217	180	255	216	168	203	—	—	—											1,814	181.4
Barred Rocks (Minimum weight 6lb.)																			
Polson, H. (37)	6.2	6.5	5.7	5.7	5.7	5.8	5.4	5.4	5.9	5.3												
	256	268	281	239	250	231	225	113	280	232											2,390	239.0
Billington, E.	5.2	5.5	5.2	4.8	3.6	5.7	5.5	5.8	5.8	4.3												
(38)	240	243*	157	233	211	278	267	92	176	213											2,142	214.2
Rhode Island Reds (Minimum weight 6lb.)																			
Norton, L. (33)	6.7	6.1	6.6	6.8	6.2	6.3	5.4	5.4	5.5	6.5												
	205	222	207	187	235*	199	245	227	194	118											2,035	203.5
North Holland Blues																			
Stubbs, J. W.	7.5	6.2	6.6	5.7	5.8	6.0	6.0	6.1	7.7	6.8												
(39)	202	252	245	242	239	179	130	25	175	149											1,848	184.8

Only birds alive at the end of the trial are recorded. Birds which were accredited for breeding have their figures for weight and egg production in heavy type. Such birds were required to attain the following standards: (a) Laid 180 eggs in 48 weeks. (b) Weigh not less than the minimum weight for the breed. (c) Laid a preponderance of 2oz. or heavier eggs during the periods when eggs were weighed. Pullets which laid a preponderance of underweight eggs (less than 2oz.) have an asterisk against the total of eggs. (d) Be free of any serious body deformity or major breed fault. Where the number of eggs is greater than 180 and egg size and body-weight are satisfactory but the bird is not accredited it may be assumed that the bird has some major fault which made it unfit for breeding or was a reactor to the blood test for pullorum.

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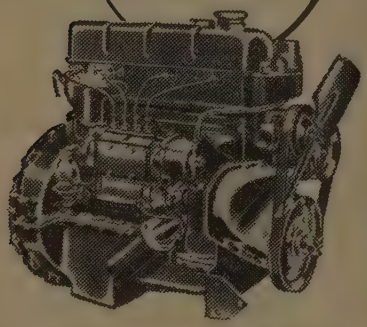

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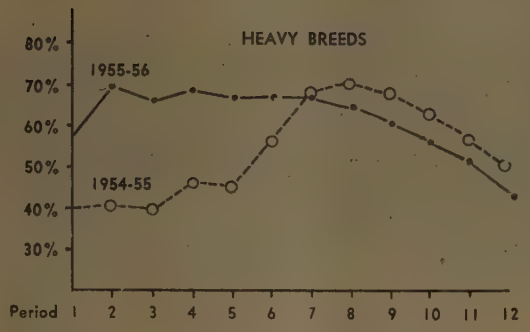
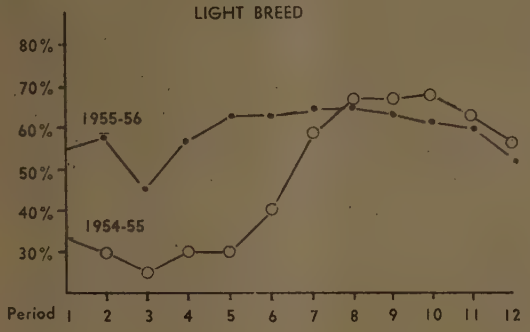
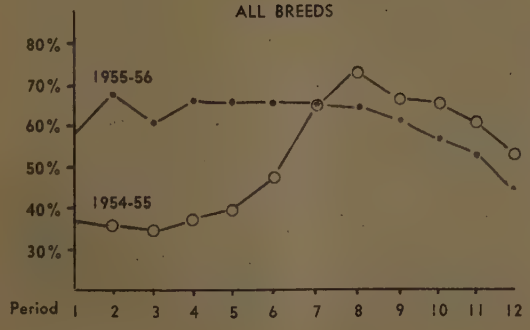


Period	1954-55	1955-56
1	40%	58%
2	41%	70%
3	40%	66%
4	46%	69%
5	45%	67%
6	57%	67%
7	69%	67%
8	71%	65%
9	68%	61%
10	63%	56%
11	57%	52%
12	50%	44%
Av.	53%	62%



Period	1954-55	1955-56
1	33%	55%
2	29%	58%
3	24%	45%
4	30%	58%
5	30%	63%
6	40%	63%
7	59%	65%
8	67%	66%
9	67%	64%
10	68%	62%
11	64%	61%
12	57%	52%
Av.	48%	59%



Period	1954-55	1955-56
1	37%	58%
2	36%	68%
3	34%	61%
4	38%	66%
5	39%	66%
6	48%	66%
7	66%	67%
8	73%	65%
9	67%	62%
10	65%	57%
11	60%	53%
12	52%	45%
Av.	51%	61%

The grain mixture used for the morning and afternoon feeds was:—

	lb.
Wheat	1,000
Barley	150
Oats	160
Maize	200
	1,510

It was not found necessary to vary the grain ration during the 48 weeks and though egg production was appreciably higher than in previous years, the condition of most birds at the end of the trial was satisfactory.

Egg Production

Egg production during the seventh trial was both highly satisfactory and interesting. Egg production can be reviewed in several ways. First, there is the average egg production according to breed, and this is computed on a hen-housed average (total eggs produced divided by the number of birds housed at the start of the trial).

EGG PRODUCTION ACCORDING TO BREED

	No. of pullets	Hen-housed average No. of eggs
Australorps	400 (280)	196.4 (177.1)
White Leghorns ..	140 (220)	191.0 (142.8)
Rhode Island Reds ..	90 (40)	199.6 (148.3)
Black Orpingtons ..	20 (10)	197.5 (195.5)
Barred Rocks.. ..	20 (*)	226.6 (*)
North Holland Blues	10 (*)	184.8 (*)
	680	196.6

Figures for 1954-55 in brackets. *No entry

There was a marked improvement in egg production in the 1955-56 trial compared with 1954-55, but results in that trial were less satisfactory than those in earlier trials.

Figures in 1955-56 are the highest so far recorded for the breeders' laying trial at Upper Hutt.

The totals of eggs laid at various periods of the year as percentages of total production are also interesting. These are given in the three graphs and sets of figures at left, which show comparisons between 1954-55 and 1955-56 for heavy breeds, light breeds, and a combination of the two. All three graphs show clearly that there was a marked improvement in winter egg production in the 1955-56 trial compared with the previous year's. It is reasonable to assume that the use of artificial lighting during winter was responsible for this increase.

In the graph for the light breed (White Leghorns) there is a fall in production in the third period and recovery in the fourth. That these birds would have gone into a moult in the third and fourth periods but for the lighting is highly probable. Lighting appears to have warded off the moult and allowed the birds to come back into production. There was less moulting among the White Leghorns during winter than in previous trials.

Finally, it is interesting to compare the production of heavy and light breeds in the 1955-56 trial. This is done in the graph and accompanying figures on page 323. The graph illustrates the advantage gained by the heavy breeds during autumn and winter (periods 1 to 6). From the eighth period until the end of the trial light-breed birds show an advantage over the heavy breeds. As the price of eggs is higher during periods 1 to 5 than for periods 8 to 12, the heavy breeds have an advantage in moneys returned for eggs produced.

Increased winter egg production in the 1955-56 trial might be thought to

be due largely to the use of artificial lighting, but that does not fully explain the considerably increased overall production. This could be accounted for partly by the generally higher standard of the birds entered for the 1955-56 trial. In particular there was an absence of some really poor pens such as have been entered in previous years.

The feeding of dry mash is considered to have contributed to better performance. This is partly supported by the increased food consumption recorded (see food consumption figures on this page). This year's consumption is the highest on record.

A more accurate assessment of the effect of artificial lighting and dry-mash feeding should be possible after the 1956-57 trial, in which these two features of management will be retained.

The pen of Rhode Island Reds (owned by R. H. Vincent, Hastings) which gave the highest number of eggs in Section A. The highest-producing bird laid 293 eggs in 48 weeks.

Future Breeding Stock

As in past years all the birds were handled and checked for major faults, production, etc., before being assessed as possible breeding birds for next season. In the large table setting out details of egg production and weights of all birds alive at the end of the trial those considered to be suitable for breeding are listed first in each pen and are marked in heavier type. The following owners of pens had the largest numbers of birds up to the breeding standard set:—

SECTION A (20 Pullets)

Australorps	Breeders
A. E. Burd (Pen 14) and F. J. Cowan (Pen 9)	16
G. E. Jorey (Pen 13), J. R. Phare (Pen 10), A. J. Smith (Pen 12)	14
White Leghorns	
G. E. Jorey (Pen 25)	16
Salisbury's Ltd. (Pen 26)	15
V. P. Ching (Pen 27)	14
Rhode Island Reds	
R. H. Vincent (Pen 20)	16

SECTION B (10 Pullets)

Australorps	
S. N. McKie (Pen 31)	8
Black Orpingtons	
E. C. Dudding (Pen 34)	6

These figures are much in advance of those of 1954-55.

On the basis of egg production alone some excellent results were also obtained. The highest-producing pens were as follows:—

SECTION A (20 pullets)

	Eggs Total	Hen-housed average
A. H. Vincent Rhode Island Reds	4,566	228.3
R. Willers Australorps	4,514	225.7
G. E. Jorey White Leghorns	4,424	221.2
L. W. Craig Rhode Island Reds	4,266	213.3
Greendale Poultry Farm Australorps	4,263	213.1

SECTION B (10 Pullets)

H. Polson Barred Rocks	2,390	239.0
E. C. Dudding Black Orpingtons	2,155	215.5
S. N. McKie Australorps	2,153	215.3

This is the first year that Australorps or White Leghorns have not given the highest production. The average of 239 eggs for H. Polson's Barred Rocks is the highest production so far achieved in the breeders' laying trial and these birds were in first-class condition at the end of the trial.

The highest individual production was from a Rhode Island Red—No. 4704, owned by L. W. Craig—with 296 eggs, but unfortunately egg size was not up to standard. This bird was closely followed by another Rhode Island Red pullet—No. 4683, owned by R. H. Vincent—with 293 eggs.

Food Consumption and Cost

As in previous years the quantities of mash and grain consumed by all pullets in the trial were recorded. It has not proved practical to keep separate records of food consumption for light and heavy breeds. Food consumption per pullet for each of the last six trials was as follows:—

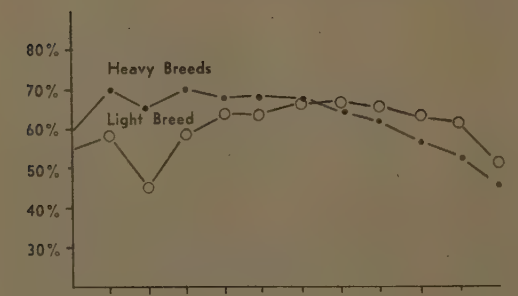
1950-51	1951-52	1952-53	1953-54	1954-55	1955-56
lb.	lb.	lb.	lb.	lb.	lb.
Mash 45.1	47.9	42.4	44.1	40.13	54.2
Grain 47.1	46.2	46.7	44.9	43.24	47.5
Total 92.2	94.1	89.1	89.0	83.37	101.7

Food consumption figures for 1955-56 are significantly different from those of previous years. The amount of grain consumed is similar, but the figure for mash has risen appreciably and is the highest so far recorded.

During 1951-52 a small section of the trial containing White Leghorns only was fed dry mash and grain, the remainder of the birds receiving wet mash and grain. The food consumption figures in 1951-52 and 1955-56 were as follows:—

	1951-52 lb.	1955-56 lb.
Wet mash	47.9	
Dry mash	52.1	54.2
Grain	46.2	41.9 47.5
Total	94.1	94.0 101.7

Percentage Production (Based on Bird Days) of Heavy Breeds and Light Breed in 1955-56 Trial



Period	Heavy breeds	Light breed
1	58	55
2	70	58
3	66	45
4	69	58
5	67	63
6	67	63
7	67	65
8	65	66
9	61	64
10	56	62
11	52	61
12	44	52
Av.	62	59

These figures give some indication that there is heavier consumption of mash where it is fed dry. The higher consumption of dry mash in 1955-56 can be attributed to the fact that whereas in 1955-56 there was a marked preponderance of heavy-breed birds, in 1951-52 dry mash was fed to light-breed birds only.

Successful wet-mash feeding depends to a marked extent on a knowledge of the requirements of birds at any time according to rate of production and body-weight. Correct adjustment of the wet-mash ration becomes most difficult in a laying trial where there are pens of birds from different strains, of varying breeds, and at differing levels of production. Consequently it is reasonable to assume that dry-mash feeding is more efficient in such a trial.

The increased food consumption in 1955-56 is reflected in an increased cost per bird for food consumed. The following figures show the cost of food per bird over the past 6 years.

1950-51 1951-52 1952-53 1953-54 1954-55 1955-56
18s.2d. 23s.2d. 23s.10d. 24s.2d. 22s.10d. 27s.11d.

The 1955-56 figure is based on an average price over the 48 weeks of £27 10s. per ton for mash and £27 5s. per ton for the grain mixture.

Food consumed per dozen eggs produced in 1955-56 was 5.92lb. compared with 5.81lb. in the 1954-55 trial. The cost of food per dozen eggs was 19.57d. and 19.2d. respectively.

The Barred Rock pullets, owned by H. Polson, Upper Hutt, which gave the highest number of eggs in Section B. They had a flock-housed average of 239 eggs per pullet, the highest in the trial.

Mortality

It is pleasing to record a substantial drop in mortality among White Leghorns and no appreciable increase in deaths among the heavy breeds. There is merit in coupling mortality and egg production. This is done in the following table:—

Trial	Eggs per pullet		Mortality (per cent.)	
	Heavy breed	Light breed	Heavy breed	Light breed
1949-50	149.6	152.6	12.5	18.1
1950-51	175.0	151.3	10.8	16.2
1951-52	178.2	167.7	19.4	14.4
1952-53	174.2	158.2	12.9	17.1
1953-54	177.0	145.7	15.4	22.8
1954-55	175.0	142.8	10.2	19.0
1955-56	197.9	191.0	10.9	8.6

The figures suggest that egg production can increase without increasing mortality. In other words birds of sound constitution can be induced to lay more heavily without breaking down. For instance, there is no evidence that birds have suffered in any way from the use of artificial lighting during the 1955-56 trial. There was no increase in the number of birds breaking down and the condition of the birds at the end of the trial was entirely satisfactory; in fact they were in better condition than birds at the end of some of the previous trials.

Of the total of 71 deaths for all breeds in this trial 20 were from leucosis (19 from the visceral type and 1 from neuro-lymphomatosis). This disease again has been the greatest single cause of deaths.

Eighth Trial, 1956-57

The eighth trial started on 20 February with 36 pens (640 pullets) as follows:—

	No. of pens	No. of birds
Section A		
Australorps	18	360
White Leghorns ..	6	120
Rhode Island Reds ..	4	80
Section B		
Australorps	3	30
Black Orpingtons ..	3	30
Rhode Island Reds ..	1	10
Barred Rocks ..	1	10

The pullets arrived in good condition—at least equal to if not better than that of the birds arriving for the 1955-56 trial. One bird was dead on arrival, owing to its getting its head through the slats on the top of the crate. Everything points to the birds getting away to a good start.

Horticultural Inspectors Safeguard the Quality of Fruit and Vegetables

AT this time of the year the apple and pear harvest is in full swing, and thousands of cases are passing into the Apple and Pear Board's receiving depots for assembly before export or release on the New Zealand market. It is not by chance that cases are of uniform size, fruit is properly packed and graded, and in first-class condition as to maturity, keeping quality, and freedom from blemish and disease. This is ensured by regulations administered by Horticultural Inspectors of the Horticulture Division of the Department of Agriculture.

Very few people at produce marts are aware of the activities of an unobtrusive officer who checks consignments of vegetables and fruit to make sure they are reasonably free of dirt and of pests and diseases. He also checks sacks and cases to see that quality and size are the same right through and that the containers are not "topped" to mislead buyers.

The Horticultural Inspector has quite a number of duties in the field, too. He regularly visits orchards, market gardens, and nurseries to see if they are infected with disease or serious insect pests, and has the power to require control measures to be taken. The object is to keep these troubles in check before they have a chance to spread and to encourage growers to take preventive measures before pests and diseases become established.

Horticultural Inspectors also assist specialist officers and instructors in advisory work, field experiments, and surveys.

These positions carry the usual Public Service privileges and offer steady promotion to those who carry out their duties satisfactorily. Vacancies occur from time to time for inspectors, and anybody with some knowledge of fruit or vegetable production or marketing could consider taking up this work. Inquiries about duties and conditions can be made at any office of the Department of Agriculture or from the Staff Training Officer, Department of Agriculture, P.O. Box 2298, Wellington.

Cattle Stop Convertible to Stock Gate

CATTLE stops at the entrance to farms have many obvious advantages. A particularly durable type of cattle stop, but one that can also be easily adapted to provide for passage of stock, is described in this article by W. A. McKellar, Fields Instructor, Department of Agriculture, Ashburton.

A FARMER near Hinds has made a cattle stop strong enough to take heavy lorries and has thus avoided having an alternative, swing gate alongside for such loads. By covering the bridge with two timbered sections hinged at each side of the gateway he can convert the cattle stop into a convenient stock gate.

The cattle stop over-all is 8ft. long and 13ft. wide. The well is 18in. deep and its inside measurements are 7ft. long and 11ft. wide. On each side of the gateway is a 6in. concrete wall 8ft. long and standing 39in. above ground level. The inside width of the gateway is 12ft. Against each of these two walls a low 6in.-thick wall was built to carry the railway lines of the bridge. In addition two similar concrete walls were built 2ft. 2in. on either side of the centre line of the bridge to give additional support where the wheels of heavy vehicles would make contact with the rails. The height of these four foundation walls is such that when the rails are bolted on to them the tops of the rails are flush with both the roadway and concrete walls built parallel with the rails along the outer and inner edges of the cattle stop.

▲ Cattle stop with timber covers up and fastened to side walls.

Timber cover → and rails of cattle stop.

▼ Timber cover partly lowered (left) and both covers in position for the transit of stock (right).

Light railway lines approximately 3in. apart were laid on these four concrete foundations over bolts embedded in the concrete and held down by nuts. An improvement on this method of construction would be a prefabricated bridge made of railway rails welded to transverse strips of flat iron so that the bridge could be laid quicker and be lifted in one piece when the well required cleaning out. Very few bolts and nuts would be necessary to hold such a bridge down.

To convert this cattle stop into a gateway for use by stock timber covers were made to cover the rails completely. So that the hinged covers would be durable and not too heavy to lift the timber used was creosoted larch. Four 7ft. x 3ft. sections were each made of 19 pieces of 4in. x 1in. timber with ½in. spacings between boards. These boards were nailed at each end to 7ft. x 5½in. x 1¼in. timber to hold them in place.

The four wooden sections were hinged in pairs with three heavy hinges and the two units so formed attached to the side walls by three hurdle hinges. These were bolted on to the timber covers so that the hinges swing upward on their pins set in the concrete side walls. The sections are held at each side of the gateway by hooks and when let down cover exactly half the bridge each.

The effective cattle stop width of this gateway is reduced to 11ft. by the folded-up timber covers at each side. To make a wider gateway it would be necessary to make the side walls and the timber sections proportionally bigger, still allowing 1ft. of width for the folded sections.

Improved Handling of North Otago Farm

By D. G. REYNOLDS,
Instructor in Agriculture, Department of Agriculture, Oamaru

FARM management surveys by the Department of Agriculture have shown conclusively that there is considerable scope for increased production from various classes of developed land. Resourceful farmers in a number of areas where there are local problems in relation to soils, climate, and other aspects have shown that the productive capacity of these areas can be substantially increased and that much of the expenditure called for can be met out of income. This article discusses results achieved on an Airedale, North Otago, farm with a system of management which could be applied to about 100,000 acres of similar country.

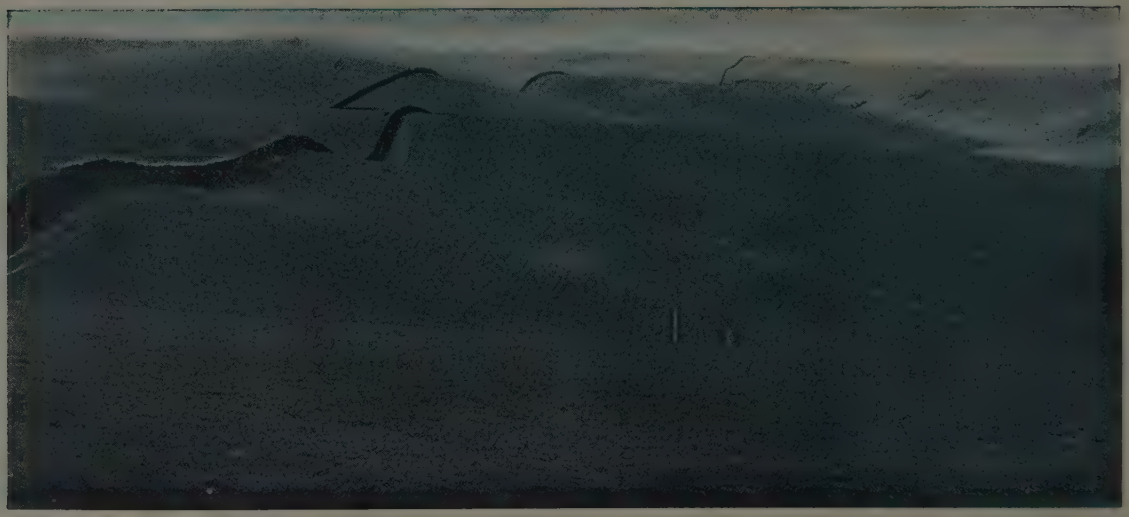
THE Airedale district, near Oamaru, is typical of much of North Otago's downlands country except that it is somewhat steeper. The cultivable tops and slopes are at an average elevation of 570ft. above sea level (with variations of 150ft.). The aspect is variable, but much of it lies well to the sun. The average rainfall is 23in., but prolonged dry periods at any stage of the year are possible, especially in summer and autumn. One important feature of the area, however, is that the soil appears to hold moisture longer into a dry period in comparison with other North Otago districts. Heavier soils and varying aspects giving wind protection are responsible for much of this.

At present the average holding in the district is between 200 and 350 acres, of which two-thirds or more is ploughable. Farms carry about 2 ewes per acre and some carry replacements as well. The ewes clip approximately 10lb. of wool and the lambing percentage is about 115. Rape is used to fatten the lambs that fail to go fat off the mothers; these comprise about 80 per cent. of the lamb crop. Several farmers have 5 to 10 acres of lucerne for hay, and turnips and chou moellier are grown as the main winter feed. All the farms in the area suffer the common problems of high cultivation costs (tracklaying tractors being needed because of the steepness of the country), drought periods, and particularly grass-grub attacks on pasture.

The Farm

The farm the management of which is to be discussed is of 346 acres and was taken up by Mr. J. J. Polson sen. in 1928. Since 1908 the property had been in rough tussock on the unworked portions, and elsewhere, where wheat and oats were grown, pastures were mainly of Yorkshire fog, other weed grasses, and poor white clover. About 1 sheep per acre was carried. When the property was taken over it was in poor condition. The owner continued until 1938 to grow 30 acres of wheat annually and

HEADING PHOTOGRAPH: Country typical of that described in this article.



The undulating type of land requires a tracklaying tractor for working and consequently cultivation costs are high. The steepness of the country, however, does provide some shelter and delays the effect of droughts.

400 fine-wool Romneys were carried by growing 12 to 14 acres of turnips for winter feed. No topdressing was done. When cropping ceased stock numbers remained static owing to the labour problems of the war years.

When in 1945 Mr. R. Polson took the property over from his father some 500 Romney ewes were carried, no crops were grown, and pastures were in poor order owing to the usual district problems already mentioned. In the coming autumn (1956) the property will be carrying approximately 900 ewes, 200 hoggets, rams and oddments, and 30 to 40 cattle. This is still not considered by any means the ultimate potential of the farm and this article indicates the lines along which successful farm improvement can be continued out of income. Accompanying this improvement have been considerable new fencing, a completely reticulated water supply, and new machinery and buildings.

Crop Rotations

The cropping rotation employed in any improvement policy is important and on it depends the efficiency and productivity of the farm. The ideal rotation must aim at giving the maximum weed and disease control with minimum cultivation and the avoidance of peak working periods, which usually occur in spring, and every endeavour should be made to do as much as possible in winter. In the planning of operations the aim is to have the minimum of idle land (necessary summer and winter fallows are not included in this category). It is also essential to ensure that the rotation is made round the farm before pastures have run out owing to their age. The aim always should be to be ploughing good lea ground for crops.

The normal rotation on this class of land in the past and on this farm particularly—old grass to chou moellier and turnips or greenfeed and then rape and grass in spring—has been singularly short and generally ineffective. A rotation such as this provides no time for thorough ground cleaning and the resultant pasture is usually poor and runs out rapidly.

On the property under discussion the system was adopted of ploughing out of old lea in May or June and sowing in chou moellier and turnips for the following winter. This ground was then ploughed at the end of August and put into rape and short-rotation ryegrass in spring. The ryegrass persists until the following spring, when the field is put into straight rape. After this greenfeed oats are sown for use in early spring. The paddock is then summer fallowed and sown to grass in early autumn or to lucerne in December. A rotation such as this gives good weed control with fallows and ensures vigorous, healthy crops, provided other factors are normal.

Pastures

Pastures form the backbone of the farm economy and other forms of feed are grown purely to provide out-of-season feed or to augment pasture production in periods of possible shortage. The aim in pasture management must always be maximum utilisation in times of rapid growth, insuring against grub attacks by the use of DDT and refraining from overgrazing during periods of drought. This entails the provision of adequate alternative feeds.

All permanent pastures are sown in early February after a summer fallow as soon as weather and soil conditions permit. The pasture mixture per acre is as follows:—

Perennial ryegrass ..	1 bushel
Short-rotation ryegrass ..	5lb.
Cocksfoot	4lb.
Timothy	1lb.
White clover	3lb.
Montgomery red clover ..	2lb.

Crested dogstail is a volunteer in the area and none is sown. The aim is to get one grazing before shutting up for winter and the young pasture is not grazed again until spring. Thereafter the paddock takes its place in the normal grazing rotation on the farm.

Fertiliser is important. Three years ago the country was found to respond well to molybdenum and since then all paddocks as they are being sown down receive 3oz. of molybdenum per acre, which is dusted on the ryegrass seed. The only liming necessary is 1 ton to 2 tons applied on the fallow before sowing down. Superphosphate is used every other year at 2cwt. per acre. Pastures always receive DDT in their first winter or spring.

Aerial Oversowing of Unploughable Hillsides

There are 95 acres of steep, unploughable hillsides on the property. The cover on these slopes consisted of a dense mat of chewings fescue, browntop, flat weeds, and some poor-type legumes which contributed little to the over-all production of the property. As the hillsides are such an

NORTH OTAGO DOWNLANDS FARM

The well-sheltered homestead and part of the lucerne acreage, which at present covers a quarter of the arable area of the farm and will be increased to a third in the near future. The illustration indicates the steepness of the country which has to be worked.

Keeping a high percentage of young pasture on the farm is essential to high production. Adequate topdressing and grub proofing are needed to keep it at maximum performance. Oversown unploughable hillsides such as those shown can form a valuable supply of feed.

Lucerne for grazing is essential if heavy concentrations of stock are to be carried and pastures are to be kept in good order. The first "cut" if used for grazing will carry up to 20 ewes with lambs per acre.

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An example of the steep and broken faces which have benefited from aerial oversowing with fertiliser and clover seed. These are now capable of carrying heavy concentrations of stock, whereas previously they carried dry stock for only a limited period

appreciable part of the farm acreage, it was obviously necessary to improve them in some manner and aerial top-dressing provided the practical answer.

The block was spelled in early autumn to allow a good dense cover to form and then in early July 1½cwt. of molybdenised superphosphate was applied with seed by air. A mixture of equal parts of white clover and Montgomery red clover was sown at approximately 5lb. per acre. The area received another 1cwt. of superphosphate the following winter and will now be left for 2 years before further maintenance dressings of fertiliser are applied. In the first spring the area had to be spelled as much as possible to allow the clover to establish and if possible set seed.

With the use of cattle the hillside area has developed into good, productive pasture carrying an appreciable number of stock. The clover density is sufficient to make the fescue and browntop quite productive and palatable, and under these conditions these grasses make valuable pasture components.

Lucerne

With the district's proneness to droughts at any time of the year lucerne is the most valuable aid in providing feed, both as hay and grazing, and permitting correct management of pastures. The original 5 acres on the property proved quite inadequate and the area has now been increased to 50 acres. The intention is to extend this to between 60 and 80 acres.

The advantage of the larger area of lucerne is outstanding and is found to be just as important to the income of the property as pasture. The following are briefly the relevant points for the use of lucerne:—

1. It provides greenfeed for the ewes after lambing and thereafter grazing for ewes and lambs until weaning time, according to available pasture. This use of greenfeed prevents early overgrazing of young pastures and better utilisation of a reduced area of cereal greenfeed.

2. After weaning, lambs can be satisfactorily carried to a certain stage before they are topped off on rape; this reduces the area of rape required for fattening and consequent cultivation costs.

3. Adequate supplies of hay can be made for feeding as required at any time of the year. The increased quantities of hay available from the increased area of lucerne mean that hay can fulfil a larger part in the supplementary feed programme, thus reducing the area required for crops such as turnips, chou moellier, and greenfeed and the cost of growing them. A further advantage is that under normal conditions haymaking entails only one annual operation, which means a considerable saving in time. Part of the area which is too steep for haying is set grazed.

4. There is a considerable reduction in cultivation costs compared with pasture in that lucerne, even under continuous grazing, will last longer than pasture, and during that period it will provide double the quantity of feed and at times of the year when it is required most. The costs of using DDT for grub proofing are reduced, since lucerne after it is established cannot be killed out by attacks of porina and grass-grub.

5. With the reduction of costs previously mentioned there is a rise in income, owing to higher carrying capacity and better performance per sheep.

6. There has been little increase in the amount of work entailed in growing the larger area of lucerne. In fact on a per pound of income basis labour requirement has dropped.

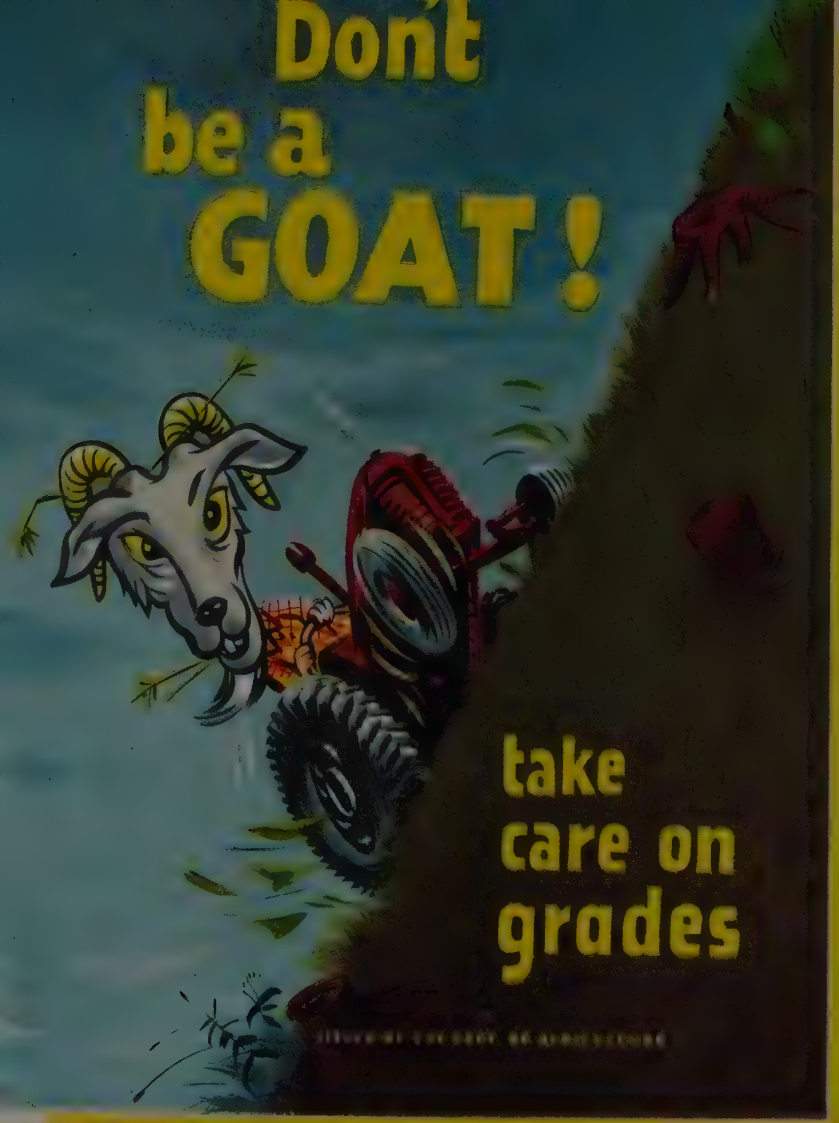
The method of establishing lucerne is well known and the farm has no unusual features to be contended with. Lucerne is sown at 12lb. per acre with inoculated seed with 1½cwt. of reverted superphosphate. It is sown on a fallow as soon as ground conditions are suitable any time after the beginning of December. The stand may be topped in the first autumn, depending on the amount of growth and weeds. Thereafter the field is treated normally except that grazing is light in the first year. The area is topdressed with 2cwt. of superphosphate per acre every year. The expected life of stands under this management is 8 to 10 years.

Crops

No cash cropping is done because of the steepness of the country. This is unfortunate, as this class of country can produce excellent seed of white and red clovers and ryegrass. The supplementary feed crops grown include chou moellier, soft turnips, cereal greenfeed, short-rotation ryegrass as greenfeed, and rape. All of these crops can be grown very successfully and good carrying capacity is normally assured.

Rape is perhaps the most risky crop because of occasional dry seasons, and the number of stock fattened per acre can vary considerably. In extremely wet winters feeding on crop can be a problem owing to pugging, but this can usually be overcome by alternating breaks and crops.

The main winter feed grown is a mixture of chou moellier and turnips. These are sown in mid-December out of old lea ploughed the previous winter. This crop is sown with reverted superphosphate at 1cwt. per



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		Total deaths	Children
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1950	—	18	
1951	—	12	
1952	—	25	6
1953	—	17	1
1954	—	20	1
1955	—	19	5
		119	13

119 Tractor Fatalities in 7 Years

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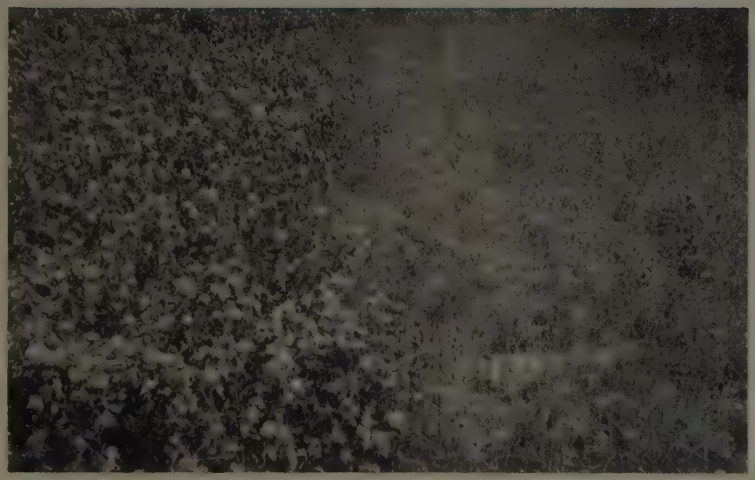

Response to molybdenum (left) on pasture compared with untreated area (right). Molybdenum and sulphur have both played a considerable part in the development of Mr. Polson's property to its present stage. Nearly all the clay downlands which have had a history of wheat cropping show an outstanding response to 4 oz. of molybdenum dusted on the grass seed at sowing down. In many cases sulphur is proving to be the valuable fraction in superphosphate.

acre and good yields are obtained. Reliance is placed mainly on the chou moellier (3lb. of seed per acre) and the turnip seeding is consequently reduced to 4oz. to 6oz. Depending to a large extent on the severity of the winter, feeding begins early in July and is rationed to last until lambing starts in the middle of August. Care is taken not to feed chou moellier too late, as toxic conditions can occur when the plants start to regrow in early spring. At this stage the flock is moved on to greenfeed with an increased hay ration.

The greenfeed used is normally Achilles oats, which are sown in autumn after rape with 1cwt. of superphosphate. The oats are fed from the time the ewes start lambing until there is sufficient growth on the lucerne for a week or more of feeding. By this time the oats have recovered and are fed off completely. The paddock is then worked up for grass in autumn or lucerne in December. Short-rotation ryegrass is also used at the same time as the oats to provide a more balanced diet. This is sown at 15lb. per acre with the early crop of rape, allowed to come away in autumn, and then used in spring before the area is sown into straight rape.

Rape is grown for lamb fattening in two blocks and follows chou moellier and turnips, if it is to be an early crop, and greenfeed ryegrass, if it is for later use. The crop as grown on this property has no unusual features and after ripening fattens lambs well. Any surplus is used for flushing the ewes.

Ewe Flock

The ewe flock comprises a good, bold type of Romney out of which 5 or 6 lambs are usually obtained. Replacements are bought in as ewe lambs and form a valuable basis of expendable stock. In good seasons more than normal replacement requirements are bought in and any surplus is sold as season and market conditions dictate. This principle, however, is used as sparingly as possible, since it is recognised that the sheep that earns the most profit is the ewe rearing a lamb.

All ewes are put to Southdown rams and lambing percentages vary between 120 and 125. Fine-woolled sheep are definitely unsuitable for this class of country, which suits Romneys ideally.

With the increased amount of feed grown and the improvement in the unploughable block it was found necessary to run cattle in addition. The prime purpose of these has been to keep pastures in order for sheep and also to convert previously unused roughage into beef. There has been no established policy in type of cattle bought. This has depended entirely on market conditions for both buying and selling. Normally, however, young Shorthorn steers are bought. Before they are sold as fats they are frequently topped off on good pasture. At present 30 head are carried and it is expected that this figure will increase.

Management

The management of the farm aims at: (a) Maximum utilisation of feed grown at the times when it can normally be expected to produce at its best; (b) avoidance of trying to carry profit-earning lines in times of normal unfavourable climatic conditions; (c) provision of adequate good feed with minimum costs in cultivation, topdressing, and labour; (d) production of maximum amounts of wool and meat per acre rather than high stock unit performance.

Combined with the four aims mentioned is the necessity to improve the capital value of the farm as a whole and increase the farm income to a point where it pays for any added effort.

The rams are put out to ensure lambing from the middle of August, which is considerably earlier than is the district practice. The reason for it is simple and the effects are far reaching. It is recognised that North Otago's best growing period is in spring and that drought conditions are more likely in summer and autumn. Therefore on this farm lambing is arranged early enough to allow early weaning and fattening. The important factor in a system such as this is the provision of large quantities of winter feed, greenfeed, and hay to fill the gap before lucerne and pasture growth starts in spring. How this is done was dealt with earlier.

At weaning time, which is in mid- or late-December, the first draft of lambs is taken and the remainder are put on to fresh pasture and/or lucerne. From then on lambs are given the best of the pasture, lucerne, and rape, and the ewes are put on to a bare pasture to lower their condition. Three weeks before tupping they are flushed on any surplus rape or good pasture saved for the purpose. From tupping until the end of June the ewes are distributed on pasture throughout the farm. The chou moellier is fed from then until lambing with increasing quantities of hay.

This stock management has been so effective that it has given both better wool and lamb weights despite increased carrying capacity per acre. This suggests that the ultimate production from the property under this system has still to be reached.

Conclusion

An indication of an improved system of management which can affect some 100,000 acres in North Otago has been given. The problems associated with it are not great and the management practices are well within the scope of the average farmer of the district. No one is yet carrying the maximum of which this class of country is considered capable, but results obtained so far indicate a very appreciable return to the farmer for the added endeavour and interest he puts into his property. Further development of this method can mean a considerable increase in production from the district as a whole and be of great benefit to North Otago.

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Safe Introduction of Queen Bees

THE art of introducing young queen bees to colonies of bees to replace old or failing queens or to improve the stock for honey production has been practised for little more than a century. In this article D. A. Briscoe, Apiary Instructor, Department of Agriculture, Tauranga, outlines several factors that govern the successful introduction of queen bees to colonies and describes up-to-date methods used.

REPLACING a queen bee in a normal colony of bees is not difficult, but when a colony has been queenless for some time the job is difficult, and very much more so if the hive contains laying workers, when it is usually a waste of time and effort to attempt it.

A contented colony at any period when there is a honey flow will usually accept a new queen if suitable precautions are taken. The commercial beekeeper, however, is not always in a position to wait for favourable weather and a honey flow to do this work. Various methods of introduction have been used, including requeening without first finding and removing the old queen.

Whether spring or autumn is chosen for the work, the problems will be similar. In areas where the colony build-up period is short before the main honey flow begins some beekeepers prefer to requeen their hives in autumn, and where the honey flow is later some prefer spring requeening.

The various methods of queen introduction are based on knowledge of the habits of honey bees.

Colony Odour

Each colony has a distinct colony odour and its individuals (the queen and workers) are recognised by their odour. The presence of a foreign worker or queen in a colony is immediately recognised, and the bees attempt to kill or remove the intruder unless it is a field worker bee heavily laden with fresh nectar. Any drifting worker bees so laden are usually not seriously interfered with during the height of the honey season.

It is important, therefore, to protect any newly introduced queen for a short period to allow her to take on the new colony odour before she is released among the bees of the hive. This can be accomplished by the use of various types of cages which protect her while at the same time allowing her contact with the bees of the hive through the wire gauze before her release. The illustrations on this page show introducing cages and combined mailing and introducing cages. The upper illustration on page 335 shows push-in cages for confining queens on combs containing brood and honey, with or without attendant bees.

Provision is made in ordinary types of cages and in the combined mailing and introducing cage for a supply of

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Mailing cages (top and lower right) and an introducing cage (lower left).

▼ A home-made introducing cage.

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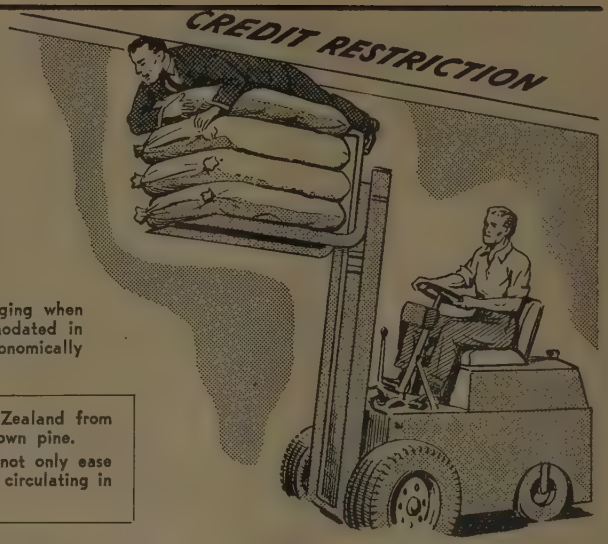

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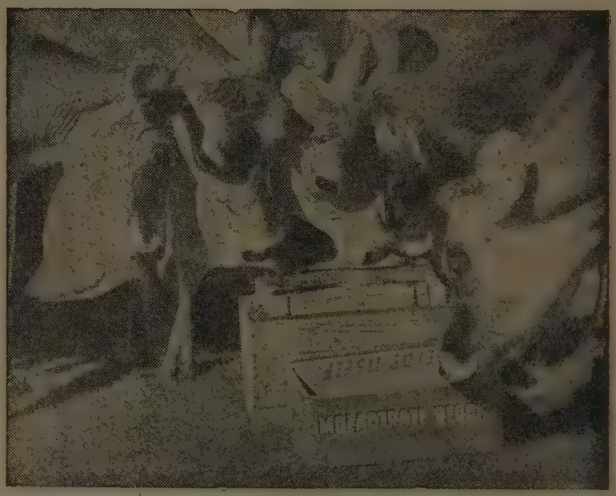

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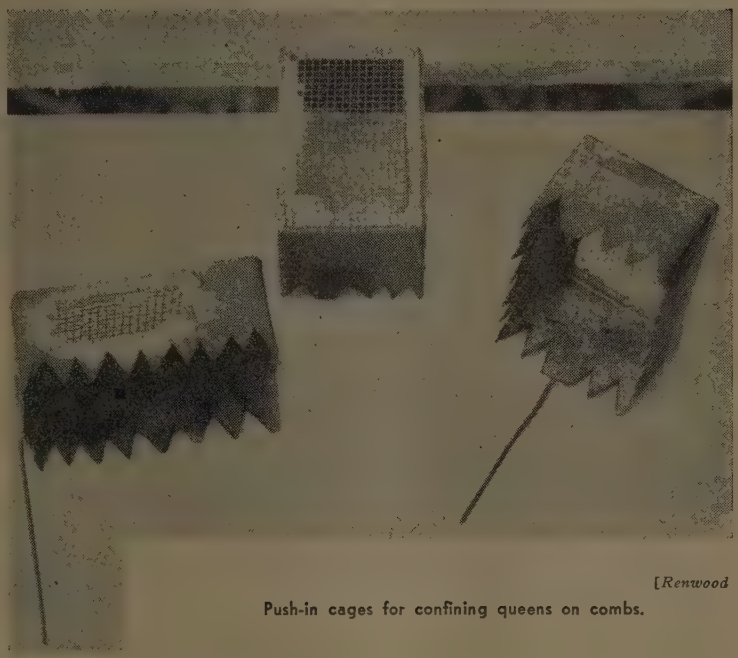
candy for food at one end and ample room for the queen and her attendants during captivity, The queen is released by the bees on either side of the cage eating their way through the candy.

Directions for safe introduction usually accompany the mailing cage and queen received from a breeder.

A colony to be requeened should first be examined for any evidence of queen cells, which should all be destroyed, and the old queen should be found and removed. The cage containing the new queen should then be placed wire downward on top of the frames of the brood nest so that the hive bees can first become acquainted with the queen through the wire gauze of the cage. The paper card covering the candy-filled opening at one end of the cage should not be removed, as the bees will gnaw it away to get at the candy. The hive should be closed and not disturbed again for at least 48 hours, when a quick examination is desirable to see whether the queen has been liberated. This should be done as gently as possible with the use of little or no smoke and a minimum of disturbance.

If the queen has been released, the hive should be gently closed down and not examined again for another 4 or 5 days. The presence of freshly laid eggs and very young brood when the hive is next examined is a sure indication that the young queen has been accepted. The hive should then be left undisturbed for a further 10 days. If, however, no eggs are present in the brood nest and queen cells have been started, the young queen has been rejected, in which case two or three of the best cells may be left to provide a young queen.



[*Renwood*

Push-in cages for confining queens on combs.

Finding Old Queens

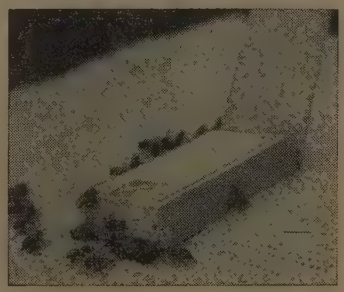
It is not always easy to find an old queen, especially when dark strains of bees are being handled. In these circumstances little smoke should be used and the hive handled very gently; otherwise the bees, including the queen, may scatter from their normal position in the brood nest.

The outside brood combs should be examined first for the presence of freshly laid eggs (in an upright position in the cells), as it is in this area where the queen would be working when the hive is opened. If she is not found there, all other brood combs next in order across the hive should be carefully examined, and if this fails to locate the queen, a queen excluder through which to sieve the bees may be used as follows:

Remove the hive from the stand and replace it with a fresh bottom board and empty hive box; place a queen excluder (with a 3in. wide batten fixed underneath along one side) on the empty box (see upper left illustration on page 336). The batten prevents the bees moving through and clustering on the outside of the box when manipulations begin. Place one super of brood from the original hive directly on top of the excluder (as in upper left illustration on page 336). Shake all adhering bees from the combs one at a time down on to the excluder and place them in the bottom box (see lower left illustration on page 336). The combs should be pushed across below the excluder as near as possible in their original order.

When all combs have been dealt with in this way and most of the worker bees have moved down

A mailing and introducing cage being placed in position.



A simple method of introducing the queen without disturbing the bees. The hole in the mat is cut so that the flap falls back into place after the cage is removed.

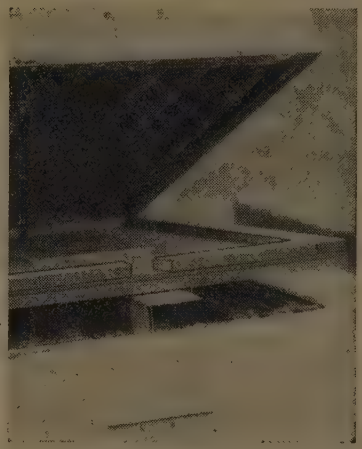
[*Renwood*
The excluder in position, showing the batten (A).

through the excluder to the brood below, the queen may be found in the box above and destroyed. The hive can then be reassembled and a new queen introduced in the usual way. A little smoke will induce the bees to move down through the excluder quickly.

Queenless Hives

To requeen a colony that has been queenless for some time is much more difficult, as bees in such a colony are usually reluctant to accept a newly introduced queen. Also if a strange, caged queen is released prematurely, she may be attacked and cased in a "ball" of hostile bees until she is suffocated or mutilated and cast out of the hive. If a "ball" of bees, which is usually about the size of a large walnut is found soon after introduction of a queen, it should be gently dropped into a container of water. The ball of bees will immediately break up and leave the queen. She can then be rescued and placed in a cage with new escort bees (young nurse bees) from the same hive and later re-introduced. To delay her release in such circumstances the card strip covering the candy hole may be replaced with a piece of tin, tacked at one end only to form a swivel. In 2 or 3 days the tin cover should be quietly moved to one side to allow the queen her freedom in the hive.

[*Renwood*
The excluder and top super in position, with space to return brood to bottom box.



[*Renwood*
The division board propped up slightly and showing the back entrance.

If the hive bees appear restless and are found biting determinedly at the wire of the cage, the queen's release should be further delayed.

Alternative Hive Manipulations

Early in the season when there is a nectar flow any colony fairly strong in brood and nurse bees can be requeened effectively without the removal of the old queen and without any disturbance in her egg laying until the new queen is safely accepted and has settled down. This is done with a queen excluder and division board as follows:—

Shake three or four frames containing brood in all stages free of bees and place these over a queen excluder directly above the remainder of the brood in the box below containing the old queen. Fill in the empty spaces with drawn worker combs and leave for a few hours or overnight. When ample nurse bees have moved up

[*Renwood*
The division board in position.

through the excluder to care for the brood above, the excluder is removed and replaced by a division board (see illustration at left) with an adjustable opening at the side or back end for use of the top lot of bees as illustrated. A new, young queen is introduced immediately above the division board, which may be removed later at any stage before the main honey flow and after the young queen has been accepted and has been laying for some time. Some beekeepers prefer to find and destroy the old queen below when the final manipulation is made, but this is not essential, as the chances of the old queen surviving after coming in contact with the young queen are remote.

There are also other methods of queen introduction including the use of paper bags and the direct smoke method, but their success depends on certain seasonal and hive conditions which are not always present.

Laying Workers

Occasionally when a colony has been queenless for an extended period and all attempts by them to raise a young queen of their own have failed, a number of worker bees eventually start to lay eggs which develop into drones.

At this stage a colony is usually reduced in bee strength, has few young bees left in the hive, and is in no condition to accept a young laying queen. In these circumstances no attempt should be made to requeen in the ordinary way. It is best to unite any such colony with a queen-right hive after removing all drone brood.

Work in the Home Garden

[*Green and Hahn*

BY May the main garden season is practically finished and the results of the past year's work can be assessed. Crops such as potatoes, onions, tomatoes, pumpkins, marrow, and squash, should be harvested and stored, as they are likely to be damaged outdoors by pests and diseases or adverse conditions. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses work in the vegetable garden in May.

A VEGETABLE garden can be an attractive place in winter, even to those who are not gardeners, if it is kept weed free, if untidy corners where unwanted grass and weeds are growing are cleaned out, and if any trash (such as old boxes, old, useless wood, stakes, bricks, and stones) is removed. Untidy corners often provide ideal breeding grounds for garden pests such as cutworms, earwigs, millepedes, slaters, snails, slugs, and wireworms. Weeds, whether among crops or elsewhere in the garden, should be destroyed, as they often serve as a means by which pests such as thrips, millepedes, mites, and aphides, which are often considered more serious than weeds, are carried over from season to season.

Weeds also serve as host plants for some virus and fungous diseases which insects transfer to succeeding crops. All weeds, long, matted grass, and untidy corners should therefore be cleared away; soft rubbish can be composted and unwanted woody material should be burnt.

Disposal of Residues

Refuse of some diseased crops can safely be composted, but if there is any doubt about the longevity or resistance of the disease to such destructive or breaking-down agencies as heat and fungous and bacterial organisms that occur in compost heaps, refuse should be burnt. Most garden refuse that is infested with active insect pests should be burnt.

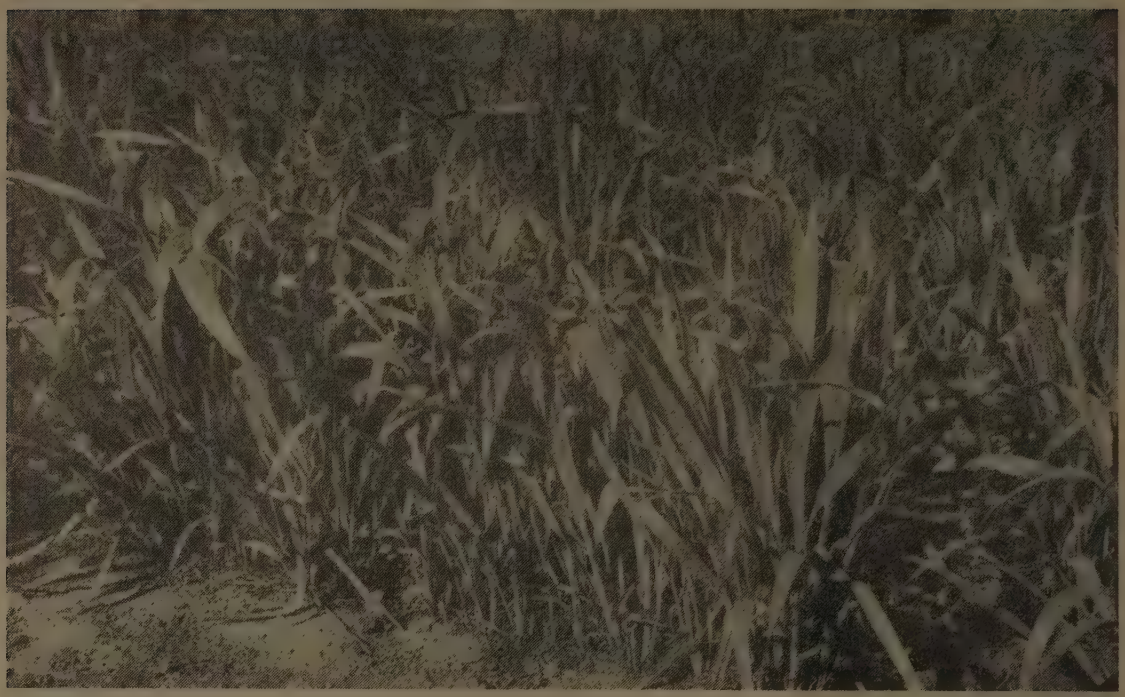
The ash of such material is sometimes a good source of potash and should be gathered and put under cover before rain leaches the nutrients from it. Ash with a high potash content may be useful as a supplementary fertiliser for crops such as onions, tomatoes, and certain root vegetables.

Wood ash or ash from garden refuse should be used with caution, as heavy dressings may have an adverse effect on the structure of some soils. Any harmful effect is usually most damaging on soils that contain insufficient organic matter. Moderate dressings are therefore recommended.

Much digging and tidying usually have to be done in the garden in May, as the residues of half-hardy crops such as tomatoes, beans, marrows, pumpkins, and potatoes usually have to be cleared away and the land they occupy dug over.

Little Sowing and Planting Possible

Little is to be gained in most gardens by planting or sowing any but



[*Green and Hahn*

Green crops such as oats (above) and barley usually grow well during late autumn and early winter and are of considerable value for soil stabilisation and improvement.

the hardiest vegetables, as usually the weather can be expected to become progressively less favourable for growth until the shortest day. If some sowing and planting is required, the soil should be well drained and cultivated. A simple method of testing soil condition for sowing is to walk on it. If the soil sticks to the soles of the boots, it is too wet.

However, cabbages can still be set out in most gardens, and where conditions are not likely to be too severe, lettuces and cauliflowers can be planted. Broad beans and spinach can be sown and in some districts peas, but unless the garden is in a very favourable situation and the weather is very good, it is best to defer sowing seeds of such subjects as carrots, onions, turnips, and radish until July or later.

Rhubarb beds should be weeded and the seed stalks removed. The top growth of asparagus should be cut down as soon as it begins to turn yellow. Potatoes and other root crops in store should be sorted over to remove those with rots. Vacant ground can be sown with a green crop or limed and attention given to the compost heap.

Compost

Composting in the home garden has become increasingly popular and important in recent years, partly because of the difficulty of obtaining animal manure.

The importance in home gardens of adding organic matter from the garden and other convenient sources to the soil can hardly be over-emphasised. A properly constructed compost heap offers an efficient method by which waste material can be converted to vitally needed humus.

May is a good month to clean up and start a compost heap, because a good deal of crop residue is usually available then and it is not always convenient to dig it into the ground immediately. Crop residues should not be burnt unless they are too woody to rot readily or are diseased.

The compost heap need not be of any special shape and the size is usually determined mainly by the amount of material available. The important points to consider are aeration, retention of moisture, mixing of succulent nitrogenous material with fibrous or woody matter, the application of adequate lime to keep down acidity, and drainage.

Aeration from the base can be provided by a field or drain pipe or a quantity of open material such as woody hedge clippings or both. Bins are sometimes used and these usually have grids at the bottom to which air is supplied by pipes. Ventilation to induce a good draught through the mass is essential in the first stages of composting, but in the maturing heap it is not needed.

Methods

Methods of composting vary widely in detail, but the principles are similar in all. Layers of the materials to be composted are alternated with thinner layers of farmyard manure or heavy sprinkling of manure rich in nitrogen, or the whole heap can be mixed so that there is enough succulent matter to facilitate the rotting of the woody or dry material. Lime is generally added as the heap is built to reduce acidity and facilitate bacterial activity.

Heaps are usually relatively long and about 3ft. 6in. to 4ft. wide and rarely higher than 4ft. In heaps smaller than about 4ft. wide by about 4ft. long the ratio of the exposed surface is disproportionately large compared with the volume and the breaking down of

the material is slower. A bin is desirable for small quantities.

The rate of decay depends largely on temperature, the nitrogen content of the materials, and the supply of moisture and air. Layers of the material to be rotted can be from about 3in. to 8in. thick. Green, sappy materials should be laid loosely; dry and more strawy materials should be moistened and firmed and preferably chopped up finely.

Activator

An activator is needed to speed the process of breaking down. Organic material such as fowl or farmyard manure or dried blood or mineral fertiliser such as sulphate of ammonia (either alone or in combination with other mineral or organic fertilisers) can be used.

When organic material such as blood and bone or farmyard manure is not available as an activator a more balanced plant food than that which is obtained by the use of sulphate of ammonia alone can be obtained by using a mixture of 4 parts of sulphate of ammonia, 3 parts of superphosphate, 1 part of muriate or sulphate of potash, and 2 or 3 parts of ground limestone. The mixture should be applied at about 6lb. to 1cwt. of average, partly wilted mixed garden trash.

The more strawy or fibrous the material is in relation to sappy material the greater will be the amount of sulphate of ammonia needed. If the amount of sulphate of ammonia is increased, more lime may also have to be added. When used alone as an activator sulphate of ammonia should be added at about 2lb. to 1cwt. of partly wilted mixed garden trash. About 1lb. to 2lb. of carbonate of lime should also be used.

Aeration

In very wet, soggy heaps rotting is usually speeded by making vertical air vents 3in. to 4in. in diameter at the top of the heap with a crowbar or rake handle at intervals of about 1ft. from the sides of the heap. Much depends on the material and the layering, but the temperature should rise within a week or two of completion. When the heat begins to decline the heap should be turned (it should by then have sunk by about one-third), the layers being mixed and the unrotted material turned to the middle.

A compost heap should be kept moist but not wet and it should be tested periodically for moisture content by inserting a stick, withdrawing it, and examining the adhering material for moisture. An unsheltered heap can be ridged to an inverted V to help shed rain. Exposed portions of the heap can be covered with a layer of soil 2in. to 5in. thick to retain heat and moisture. Spraying exposed heaps with DDT gives protection against flies.

Broad Beans

Though broad beans are not among the most popular vegetables, they are among the most nutritious. If sown in autumn or early winter, they mature when in most home gardens fresh vegetables are lacking in quantity and variety. The flavour and texture of broad beans is not as widely appreciated as that of beans which can be grown during the frost-free months, but if the pods are harvested while they are young and cut up or slashed for eating, as young dwarf or runner bean pods usually are, their flavour and quality are good.

Broad beans can be sown at any time of the year when soil conditions are good. However in most districts sowing is confined to autumn, as the hardiness of broad beans ensures that the crop will establish in any but the severest winters and most exposed situations. The beans are then able to mature in spring or early summer, usually before conditions become excessively dry.

In most districts May is the preferred month for sowing broad beans. They do not need special soil, but it is

[*Green and Hahn*

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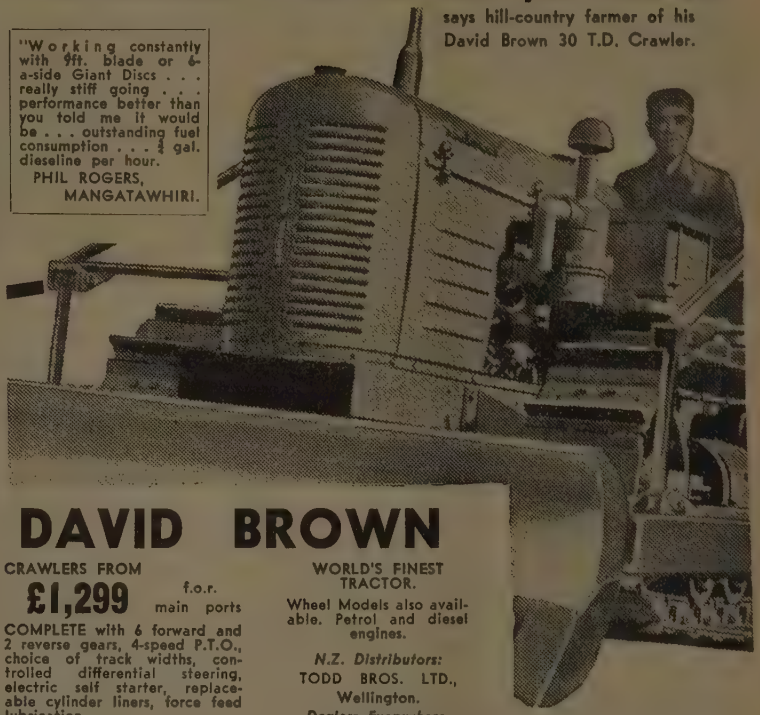

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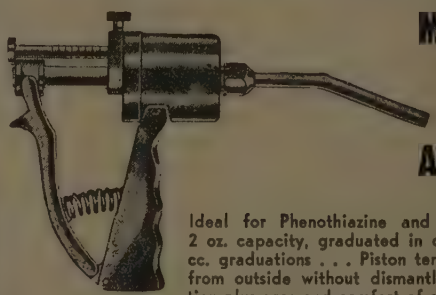

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not advisable to sow them in wet, sticky soil or light soil that tends to dry out. They do well in fairly heavy, moist, well-drained soils that have been thoroughly cultivated and into which has been worked, if the soil lacks organic matter, a moderate amount of material such as compost or well-rotted farmyard manure.

Moderately rich soils usually give satisfactory results, though too much nitrogenous material should be avoided for autumn-sown crops, as it may induce rank or soft growth which is readily damaged by winter weather or disease. A mixture of 1 part of sulphate of ammonia, 4 parts of superphosphate, and 1 part of sulphate or muriate of potash, all by weight, or 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate or muriate of potash worked in at 2oz. to 3oz. per square yard, according to the fertility of the soil, is likely to give good results on most soils that have been well dressed with balanced fertilisers for previous crops.

Though broad beans are tolerant of a fairly wide acid-alkaline range (pH), they will not thrive in excessively acid conditions. In moderate- or heavy-rainfall districts growth in most soils not recently limed will be improved by applying carbonate of lime at about 2oz. to 4oz. per square yard. It is best worked in some time before sowing.

Apart from weed control, beans should need little attention when young, but it is usually advisable in winter or early spring when the weather is boisterous to put a little soil against the stems of autumn-sown plants to help support them. Tall varieties can be stopped when they are 30in. to 36in. high by pinching out the tops. This encourages the plant to develop sturdy growth and is often sufficient to check an attack of black aphides in its early stages, particularly if the aphides' natural enemies, such as lacewing flies, ladybirds, and their larvae, are numerous.

Where tall varieties are grown it may be advisable to support plants as they develop or as they become heavy with pods. One or more strings along the sides of rows tied to stakes at intervals of 5ft. to 6ft. will save the plants from being blown over.

[*Green and Hahn*

▲ Broccoli or self-protecting cauliflowers have strong leaves which enclose and protect the head.

▼ Brussels sprouts should be gathered from the bottom upward and the leaves removed as they turn yellow.

[*Green and Hahn*

Sowing

In deep, well-drained soils broad beans are best set 2in. to 3in. deep, preferably with a trowel, and 4in. to 6in. apart in the bottom of a drill about 3in. deep. Seed may be planted in double rows 10in. to 12in. apart, with each double row not less than 26in. apart. Single rows are sometimes preferred. They should be 15in. to 18in. apart.

Varieties

Two main varieties of broad beans are grown in New Zealand, the broad-podded or Windsor type and the long-podded type. The Windsor type is usually considered to be of better flavour, but the long-podded beans are hardier and often yield more heavily.

Brassica Crops

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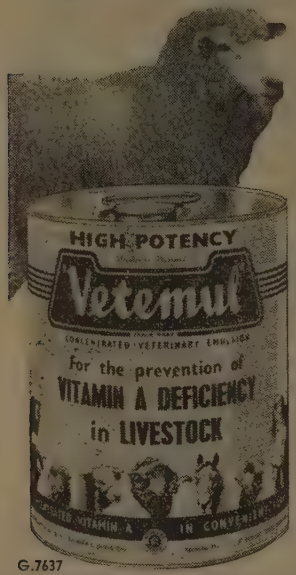

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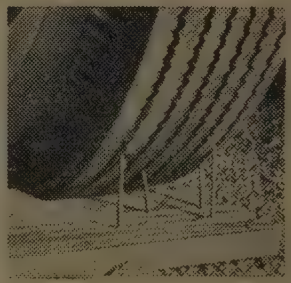

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as All Year Round, Early London, and Walcheren, can be set out as advised in last month's "Journal."

The grey cabbage aphis is often troublesome at this time of year and unless it is destroyed infestation increases steadily throughout winter. It usually spreads from summer-planted greens to spring cabbage and young cauliflower plants, causing leaf distortion and fouling. Grey aphides can be controlled by spraying on a warm, still day with nicotine sulphate, 1¼ teaspoons to 1 gallon of water plus a little soap to activate the nicotine, or with HETP or lindane.

The earlier-maturing varieties of winter cauliflowers and broccoli should now be coming into bearing. Types best suited to districts where moderate to heavy frosts can be expected are self-protecting; that is, the leaves completely enclose the curd, shutting off light, shedding moisture, and affording protection from rain and frost. If the curd is exposed, midribs of one or more of the longer encircling leaves should be broken so that the broken end is over the curd to give it protection. The leaf will remain alive until the curd is ready for harvesting.

Brussels Sprouts

Brussels sprouts should be harvested regularly by the removal of the sprouts as they reach full size. The bottom sprouts should be gathered first. Leaves should be removed from the base as they turn yellow. Plants in exposed situations may have to be staked, as they usually tend to become top heavy with leaves and sprouts as harvesting progresses.

Various diseases which cause spotting or blotching of the leaves commonly develop on members of the cabbage family toward the end of May. If only a few outer leaves are affected, the trouble may be checked by their removal. Where infection is more advanced protective bordeaux or copper oxychloride sprays may be advisable, though most of the diseases which cause forms of leaf spot increase mainly owing to the cool and moist conditions that occur in late autumn or winter.

Lettuces

Lettuces for setting out or growing in early spring can be sown in May in a favourably situated cold frame or in a favourable situation where the soil is well drained. Where these conditions are lacking it is usually best to defer sowing until July or August. As growth of established lettuce crops is slow in most districts in May, the plants should be kept weed free and the soil between the rows should not be packed excessively by treading on it.

When plants are being set out a sheltered site with a northern aspect where the soil has been well cultivated and manured is desirable. If drainage is poor or the ground likely to be rather cold, young plants should be set out on a raised bed.

Like most salad crops lettuce should be grown quickly. At this time of the year, when in most districts conditions are not good for growth, a light sandy loam rich in well-rotted organic matter such as farmyard manure or compost is desirable for growing plants in or setting them out into.

Varieties

Good varieties for setting out in May include Imperial 615 (Neapolitan Winter) and Triumph.

Peas

Garden peas are hardy and yields are usually higher and the quality better when the crop matures under comparatively cool conditions, but heavy frost is liable to affect the setting of the flowers, and frost following a mild period during which soft growth has developed may damage the haulms. In districts where winter conditions are severe autumn sowing should be made sufficiently early to enable the young plants to become established but not so early that they make soft growth. Losses from autumn sowing may be serious in severe weather, but in well-drained soils in districts where winters are not hard autumn sowing is usually satisfactory.

In many districts, however, autumn-sown crops mature little ahead of crops sown in favourable conditions in spring. For autumn and spring sowings seed should be dressed with a suitable seed protectant, such as spergon or tetroc. The peas should be shaken for several minutes in a tin containing enough of the chemical to coat the seed. Afterward excess should be removed by tapping the tin sharply so that the powder falls to the bottom.

Pea seeds germinate and the plants make vigorous growth at temperatures considerably lower than those suitable for many other vegetables.

Sowing

Seed should be sown 1in. to 2in. apart in V shaped or broad, flat drills, which can be drawn out with the hoe 18in. to 36in. apart according to variety. Drills should be 2in. to 3in. deep, except where conditions are hot and dry, when they should be considerably deeper, so that though the seed should not be covered with more than 1½in. to 2in. of soil, the roots will be well down in the cooler and moister levels.

The seed-bed should be thoroughly cultivated, as a fine, well-prepared seed-bed has an important influence on the promotion of even, full germination and uniform maturity at harvest.

Protection of newly emerged peas against birds is essential in some districts, though birds are troublesome mainly in early spring, when food is short. Pea guards made of wire netting are effective if the ends are blocked, but they should be moved before the peas become entangled in the wire. Cotton stretched over the shoots is also effective if a number of strands, which may be criss-crossed or placed in parallel lines, are used.

[*Green and Hahn*

Leeks respond to heavy manuring and the stems blanch readily if the plants are earthed up as they grow.

Manuring

Peas, though they fix nitrogen and improve the physical nature of most soils, are an exhausting crop because they have high demands for plant foods. For this reason and because the period between sowing and harvesting of most varieties is comparatively short, the soil should be well cultivated to enable the roots to spread freely and gather rapidly the nutrients needed by the plants.

Crop failures are often due to poor drainage and sometimes to inadequate liming, though liming should not be too heavy, as a neutral or slightly acid soil suits most pea crops. An annual dressing of 3oz. to 4oz. of lime per square yard is usually satisfactory, though heavier dressings may be needed in high-rainfall districts.

On soils of fairly high fertility, such as virgin soils or those that have been heavily dressed with organic manure for a previous crop, fertiliser applications need not be heavy. A dressing applied at about 1oz. to 2oz. of superphosphate per square yard may be sufficient, but on most well-worked garden soils a complete fertiliser (such as a mixture containing 2oz. of sulphate of ammonia, 6oz. of superphosphate, and 1oz. of sulphate or muriate of potash) at 1oz. to 2oz. per square yard gives good results. Peas are highly sensitive to fertiliser injury and care should be taken when applying the

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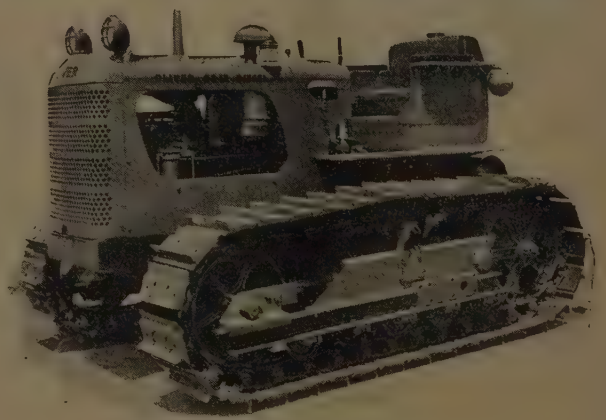

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mixture so that it does not come in contact with the seed.

Varieties

Popular varieties of peas for autumn sowing for early spring cropping include William Massey and Little Marvel.

Stored Crops

Onions

Onion crops that have been picked over to eliminate immature, soft, and thick-necked bulbs keep well if they have been well ripened and properly cured before being stored. They store best in dry, cool conditions with a good circulation of air.

The best storage temperature is 32 degrees to 36 degrees F. They tolerate slight freezing, but not alternate thawing and freezing. There is little danger of onions freezing in store unless the air temperature goes below 28 degrees F. (4 degrees below freezing) and remains there for a considerable period. As with most other vegetables in store keeping quality is greatly affected by the amount of moisture in the air (relative humidity).

Sprouting of stored onions is little influenced by humidity, but is increased with increase in temperature. Growth of roots of stored onions, however, is largely prevented by low humidity (60 to 65 per cent.), which also usually checks the spread of rots, though it causes more shrivelling and softening. Respiration or breathing is lowest, too, at low temperatures, so that losses of carbohydrates (sugars and starches) are less.

Some loss due to shrinkage, rotting, sprouting, or rooting is inevitable in the conditions under which most onions are selected and stored. Shrinkage is usually due mainly to loss of water, sugars, and other products used in respiration.

Most of the best long-keeping varieties of onions cure and seal up well at the neck and are hard and firm with thick outer scales. They have the longest rest period and do not usually sprout for several months, even if stored in conditions favouring growth. With them the young leaves and the localised region of active cell division from which permanent tissue is derived are totally enclosed by the surrounding scales, which tend to retard the intake of oxygen and so prevent growth. Growth finally results largely because in time the bulb scales become more permeable and enough oxygen gets in to allow growth to start.

Experiments have shown that where temperatures or other factors in storage cannot be so managed that sprouting is kept down to a satisfactory level good results may be obtained if the plants are sprayed with maleic hydrazide 2 weeks before harvest. This is not recommended in the home garden, as under most circumstances it should be possible to maintain onions in satisfactory storage without having to resort to means which may have undesirable results unless carried out precisely.

[*Photo News*

Onions in store should be looked over from time to time to get rid of any that are rotting.

Pumpkins, Squash, and Marrows

Pumpkins and squash keep well if they are first cured and then stored at a suitable temperature and humidity. After harvesting, the fruit should be ripened or cured to harden the shell. Fruit should be handled carefully during harvesting and storage, as if it is bruised or injured, it decays more rapidly than if uninjured. Fruit is best cut from the vine with a portion of the stem attached, because skin breaks of any kind are usually followed by decay. If the stem is broken off, it usually leaves a large scar, which rot organisms may enter.

Ripening or curing can be done in the field when conditions are dry and warm, but as such conditions rarely prevail in May, the fruits are best placed in dry, warm storage. Cold storage of pumpkins and squash is unsuitable because of the high humidity that usually prevails.

Authorities differ a little on storage temperatures, but most agree that pumpkins and squash keep best at relatively high storage temperatures. Generally temperatures of 40 to 42 degrees F. or even up to 50 degrees with relative humidities of 50 to 70 per cent. seem likely to give the best results. Weight loss and shrinkage are greatest at the higher temperatures; more rots are likely to occur at the lower.

Unlike pumpkins or winter squash, marrows should be harvested before the fruits are of a full edible size; that is, before the rind or skin begins to harden. Usually the condition can be judged by thumbnail pressure. If the rind is hard or resistant to thumbnail pressure, the marrow has passed its best.

Taprooted Crops

In New Zealand lifting and storing of taprooted crops, such as beetroot, carrots, parsnips, swedes, and turnips, are usually unnecessary. However, storage out of the ground may be desirable where, through lack of space or foresight, the same type of crop has been grown in the same ground for two or more seasons and diseases which tend to produce root rots have increased greatly. Lifting and storing may also be necessary where the soil is heavy and tends to be sticky and poorly drained or where the crops are grown in a place difficult of access to the housewife in winter.

Parsnips and swedes are usually thought to be of better flavour and texture if subjected to moderately heavy frost, but some varieties of beetroot are susceptible to damage from severe frost.

Because of lack of space, or difficulty in providing good storage conditions, long storage of root crops should be avoided as far as possible. Usually if roots have to be dug, enough can be lifted to provide supplies for 2 to 3 weeks. They can then be stored in cool situations where there is enough moisture to prevent shrinkage. If longer storage is necessary, roots may be stored in a clean, cool, ventilated situation in sand that is slightly damp. A temperature near to freezing (32 degrees F.) or a little higher, if humidity is high, is most satisfactory.

If home-grown supplies are inadequate for winter or early spring, a good policy sometimes is to buy taprooted vegetables in quantity, such as by the sugar bag or small sack, during late autumn or early winter, when good market supplies usually depress prices. If such roots are replanted in rows or beds in well-drained soil in an accessible situation, they may be planted closely and usually keep fresh throughout winter and spring as they re-establish. They will be available until early spring, when they begin to send up seed stalks, which, if allowed to develop, spoil them for culinary use.

Three Factors are Important in

Winter Egg Production in Household Poultry

JUST as vegetables straight from the garden have a particular value for most householders, eggs fresh from the nest boxes in the poultry house have added attraction. At no time are they more welcome than in winter, when in some senses they are "out of season". This article by the Animal Industry Division of the Department of Agriculture explains how a supply of eggs during winter can be ensured by attention to the choice of bird kept, good housing, and proper feeding.

NOT many years ago the average household poultry keeper rarely obtained a supply of eggs during winter. The usual contention was that the community depended for winter egg supplies on the commercial poultry producer, who had greater skill in handling poultry at that time of the year. Such a statement would be more difficult to substantiate today, as many household poultry keepers have learnt the necessary poultry husbandry practices that are aids to winter egg production.

Type of Bird to Keep

One of the most important factors in winter egg production is obviously the type of bird kept. There is only one class of bird which can be expected to lay during autumn and winter and that is a pullet or the laying bird in its first season. Those householders who keep birds beyond their first laying season must not expect to get satisfactory winter egg production. Those who insist on keeping their hens for several years, because they have become pets, can expect eggs only during the "flush" season in spring and summer.

GOOD STOCK: A Barred Rock which laid 281 eggs in 48 weeks.

The best results are likely to be obtained with pullets which come into lay for the first time in, say, February or March, just when egg prices are rising and reaching their peak. Such pullets will have been hatched in September of the previous year. Pullets are therefore a first essential.

Breed of Bird to Keep

So often is the question asked: "What is the best breed for egg production?" The answer is that there is no best breed for egg production. Egg production from a pullet depends greatly on how she has been bred or, as is often stated, on "the strain" of that bird. There are good or poor layers in all the breeds commonly kept for egg production. What matters is the productive powers, constitution, and health of the parents from which the pullets have been bred. Therefore the source of supply of the pullets purchased is most important. However, for winter egg production there is some advantage in choosing pullets from one of the heavy breeds such as Australorps, Rhode Island Reds, or Barred Rocks, as these breeds are more likely to give higher production then than light breeds such as the White Leghorn. During winter White Leghorns are not so easily induced to lay heavily and may more easily develop a neck moult or be more readily affected adversely by bad weather.

Use of first-cross pullets such as Australorp x White Leghorn, White Leghorn x Australorp, or Rhode Island Red x White Leghorn is worth while. (The breed of the male bird is stated first.) In recent years the popularity of crossbred pullets for egg production has increased markedly. The reason for this is largely twofold. Breeding experiments have shown that the progeny (crossbreds) where two pure breeds are mated often give a higher egg production than either of the strains of the two pure breeds which are used in the mating. Again crossbred progeny are normally favoured with a more vigorous constitution than the purebred birds.

For these reasons and because generally finding a satisfactory source of supply of crossbred pullets is comparatively easy householders are recommended to consider this class of bird. For winter egg production crossbreds can give excellent results.

Housing Must be Good

For satisfactory winter egg production housing must be good. Dry conditions and freedom from draughts are

GOOD FEEDING: A type of dry mash hopper well suited to small units of laying pullets. There is a minimum of waste from this type of hopper.

essential. This does not mean coddling the birds or creating stuffy conditions. Fresh air and the benefit of all the winter sunlight possible are highly desirable. Stuffy and dark or damp conditions cause colds, which very quickly ruin winter egg production. Birds generally should not be allowed out on to a limited outside run, which often during winter becomes wet and dirty. If adequate light and air are provided by an open portion of the front of a lean-to house, the birds may be housed inside, intensively, throughout winter with advantage. Where this is done not less than 4½ to 5 square feet of floor space per pullet should be allowed, particularly where the unit of birds kept is between 6 and 12 pullets.

Plenty of Dry Litter is Needed

As the pullets are to be housed intensively during winter, a good depth of litter on the floor is essential. Because it is quite undesirable to clean out this litter during winter, unless an emergency arises such as very wet litter because of driving rain, it is important to build up a satisfactory depth of, say, 6in. in autumn and before winter sets in. The practical method of handling litter is to put down, say, 2in. to 3in. to start with and as soon as this has become broken down to a moderate extent to add a further 2in. to 3in. of fresh litter.

The whole should be stirred up regularly, about once a week, throughout winter to prevent its matting down, collecting droppings on the surface, and ultimately becoming damp. Good, dry litter is an aid to satisfactory winter egg production and the prevention of colds. Wheat straw, wood shavings, and sawdust or a mixture of these materials all make good litter for a laying shed.

The litter should not be skimped in quantity and it should be stirred up regularly. These are means of preventing damp and dirty poultry shed floors, which are sure deterrents to good winter egg production.

GOOD HOUSING: A neat, well-designed household poultry house giving ample light and ventilation.

Proper Feeding Essential

Good feeding is essential. It is a fallacy that good laying pullets can be overfed. The more eggs laid the greater is the amount of feed needed to make those eggs.

There are a number of feeding systems, but satisfactory winter egg production can be obtained by feeding dry mash and grain. The mash should be placed in a hopper and be available to the birds all day. A small grain feed can be given in the early morning and a good grain feed late in the afternoon. A total of about 2oz. of grain per pullet should be fed daily—½oz. to ¾oz. per bird in the morning and 1¼oz. to 1½oz. in the afternoon. More than these amounts should not be given, as the birds must be induced to satisfy their total food requirements by eating mash, which stimulates and maintains egg production.

Most laying mashes contain about 10 per cent. of meat meal. The quantity of protein supplied by a mash containing this quantity of meat meal is really insufficient for winter egg production, when grain is fed in addition to mash. Consequently household poultry keepers should give their birds a trough (or a section of the mash hopper) of meat meal in addition to the mash. The birds can be allowed to consume this meat meal at will during winter.

Consumption may appear high at the start, but the pullets soon settle down to eating what they require. Lack of sufficient protein during winter is often a limiting factor in egg production; animal protein in a mash or diet for laying birds is an essential.

Vitamin A, which is present in good fresh green food, is also an essential for winter egg production. However, such food is often not available in regular supplies during winter and it is therefore strongly recommended that a fish oil rich in vitamins A and D should be added to the mash throughout winter. Such oils are easily procurable today. Generally about 3 tablespoonfuls of oil should be mixed in thoroughly with 10lb. of mash. The oil can be mixed more easily in with grain, but the mixing must be done daily and the grain fed in a trough, not scattered over the litter. Even if a fish oil is fed in the mash or the grain, greenfeed must be given daily when supplies are available. Few people like pale, insipid yolks. Fresh greenfeed is an excellent means of ensuring that yolks are coloured properly.

Reminders for May

Pullets should now be in lay. If they are not, check over the management and feeding to see if any mistakes are being made.

If pullets do not look like coming into lay in the near future, were they ordered too late and late-hatched pullets supplied in consequence?

Were the pullets given 2 c.c. capsules of carbon tetrachloride just before they came into lay to ensure that they were not carrying intestinal worms? If not, it may be advisable to give these capsules immediately to prevent a build-up of these internal parasites, which will lower the stamina of the birds and reduce egg production.

Check for body lice on birds, particularly on any of last season's pullets being held over for a second year. Nicotine sulphate or a perch paint on the perches immediately before the birds perch at night will soon destroy these parasites.

Any pullet with typical symptoms of fowl paralysis—going lame in one leg, going blind, or dropping one wing—cannot be cured. However, it is unlikely to infect any other pullets.

Have the laying pullets got access to ample shell and metal grits? Shell grit is helpful in producing well-shelled eggs. Metal grit is essential for the gizzard to give efficient digestion of the food.

Care of Livestock during May

Contributed by the Animal Research Division

BLOOD POISONING IN HOGGETS

BLOOD poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine which confers very good immunity can now be bought in New Zealand. On properties where losses have previously been experienced hoggets should be vaccinated a fortnight before they are placed on turnips. The nearest Veterinarian or Livestock Instructor should be consulted concerning the method of vaccination.

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, feed silage to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This will also enable some paddocks to be spelled.

UNTHRIFTY CALVES

The best feed for calves is good, fresh pasture and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production and will help to reduce mastitis.

INOCULATION OF DOGS AGAINST DISTEMPER

A very high percentage of cases of distemper in dogs can be prevented by vaccination. This is best done when the pups are 3 to 4 months of age. The virus has a short life and must be specially ordered. It is therefore necessary to notify the Veterinarian at least a month before the pups are to be vaccinated.

RED WORM IN HORSES

Red worms can seriously reduce the efficiency of working horses and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as in certain conditions it may prove dangerous. Treatment should be given before winter.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended 29 February 1956, with comparative figures for the same month and 7 months of 1954-55, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
February 1956	16,714	320	17,034	—
February 1955	14,065	293	14,358	—
Increase or decrease ..	+2,649	+27	+2,676	+18.638
7 months ended 29/2/56	135,362	2,304	137,686	—
7 months ended 28/2/55	126,192	2,374	128,566	—
Increase or decrease ..	+9,190	—70	+9,120	+7.094

Butter in store at 29 February 1956 was 29,070 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
February 1956	8,083	1,744	9,827	—
February 1955	8,444	2,072	10,516	—
Increase or decrease ..	—361	—328	—689	—6.552
7 months ended 29/2/56	59,777	10,182	69,959	—
7 months ended 28/2/55	62,078	15,786	77,864	—
Increase or decrease ..	—2,301	—5,604	—7,905	—10.152

Cheese in store at 29 February 1956 was 26,427 tons

If these figures are converted into butterfat equivalent, there is an increase of 3.457 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Autumn Pasture Management: Cultivation for Autumn Cereals

Seasonal Notes by the Extension Division

AUTUMN pasture management, particularly on North Island dairy and fat lamb farms, should aim at early autumn topdressing to stimulate late autumn and early winter growth and the closing of fields to save this growth to feed in late winter and early spring. To save grass on dairy farms it is necessary to start supplementary feeding before grass growth ceases so that fields can be closed before pastures have been grazed bare.

FINISH TOPDRESSING SOON

UNLESS topdressing is completed shortly, little additional growth from its use can be expected this season, as when cooler weather comes soil temperatures will fall below those required for rapid growth. Fertiliser applied now should preferably be used on those paddocks where there is a cover of grass 2in. or 3in. long. Paddocks closed recently for spring use will benefit more than those intended for wintering on. On fat lamb farms topdressing now will improve the feed position and ensure that ewes are better fed before and during lambing. If potash is to be used, it must be applied shortly, so that the grasses and clovers can utilise most of it before it leaches through the soil.

—G. A. BLAKE

* * *

KEEP CLOSING FIELDS

THE best means of ensuring adequate supplies of good-quality wet-stock feed during July and August is by closing large areas of pasture during April and May, and farmers should continue to close paddocks during May. Pasture left after autumn with a few inches of cover will continue to grow in winter and will recover quickly after grazing, whereas continuously close-grazed swards produce very little winter feed and are slow in coming away in spring. It is good practice to hold ewes tight this month and use the pasture saved for early lambing ewes and for "steaming up" the flock in July. As dairy cows are nearing the end of their lactation, they are incapable of making full use of valuable autumn pasture and this should be saved for feeding to newly calved cows. Silage may be fed now so that paddocks may be closed. If possible, the more fertile paddocks should be closed in May, as the poorer ones will probably be incapable of much recovery before winter. Pastures containing winter growing grasses, especially short-rotation ryegrass, should be chosen. It is not wise to close paddocks which are weak in clovers, as the soil fertility status is not likely to be high in these and closing them would further suppress the clovers. Before the paddocks are closed they should be harrowed and topdressed.

—B. A. GUNNING

* * *

SOUTH ISLAND DAIRY FARMS

THE saving of growth for winter feeding is often not fully satisfactory in the South Island if dry weather is experienced in autumn. Fields should be closed at fortnightly intervals from March onward, but in dry autumns a crop of greenfeed cereals such as ryecorn should be sown. In most districts nitrogenous fertilisers can be used to advantage to promote pasture growth in autumn and early spring.

—J. D. G. DAVIES

* * *

CULTIVATION FOR CEREALS

THOUGH cultivation for seed-beds for cereal crops in Canterbury varies with the season, its method and scope are mainly dependent on soil type and the place of the crops in the farm rotation. However, the importance of timely cultivation cannot be over-emphasised. Only practical experience can teach the correct times to use cultivating implements. If the soil is worked when it is too wet, it becomes harsh, and if it is left in the rough for too long, later working becomes difficult.

OATS

In Canterbury oats are usually sown in autumn and used as greenfeed before saving for grain or chaff. Generally, this crop follows wheat or barley and in these cases the straw from the previous crop is burnt and the land ploughed directly after harvest. Rolling on the furrow helps to conserve moisture and facilitate later cultivation with grubber and harrows. Though it is desirable to leave the surface rather cloddy, the soil underneath should be fine. Sowing at 2 bushels per acre is carried out from the end of February to mid-April. If the crop is to be spring sown after grass, the land should be deep ploughed during winter and worked to a relatively fine seed-bed with grubber, roller, and harrows.

BARLEY

The bulk of the barley crop is sown at 2 bushels per acre after grass, and though skim ploughing is at times carried out, the most common practice is to deep plough during winter. This ensures thorough weathering of the soil and thereby reduces subsequent cultivation costs and improves the structure of the soil to a degree that could not be accomplished by any amount of hasty cultivation. The choice of implements and the amount of top work necessary will be governed by local conditions, but whether discs or grubber are used the first spring cultivation should be shallow, with later work designed to develop a good tilth to the bottom of the furrow.

WHEAT

The majority of wheat crops are sown at 1½ to 1¾ bushels per acre from late April to mid-June, and, as with oats and barley, 1cwt. of superphosphate is drilled with the seed. The seed-bed should be fine below, but if the surface is not cloddy, it will cake with rain and frosts during winter. Therefore land to be sown to wheat after crops such as rape, potatoes, or peas may require practically no surface cultivation. After grass it is usual to skim plough and thoroughly work the skimming, though sometimes the grubber is used instead of the plough. This early working speeds up the decay of turf and when the land is eventually deep ploughed the amount of surface cultivation necessary is reduced to a minimum.

—E. G. SMITH

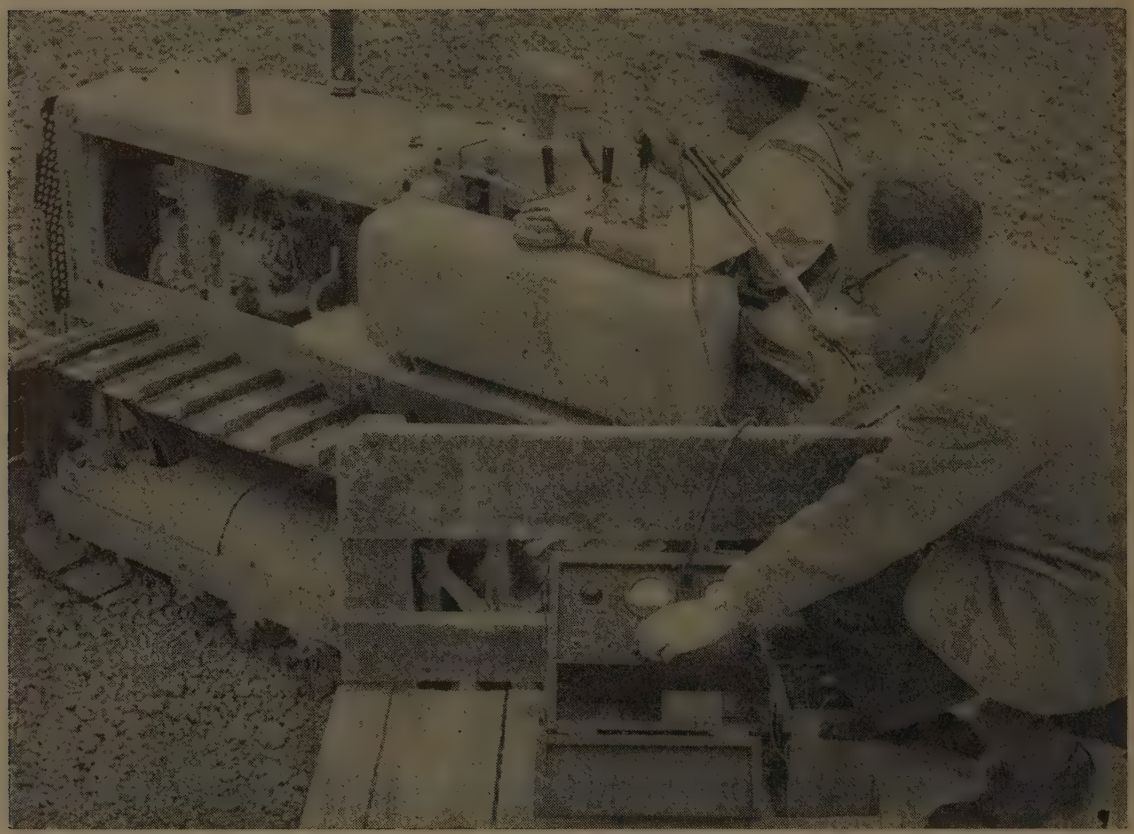
* * *

LATE CUT OF LUCERNE

THE number of cuts that can be taken from a good stand of lucerne during a season must vary according to climatic and regional conditions. Most stands on fertile soils will produce four or five cuts, but it is often problematical whether a late cut should be taken. The last cut is generally ready in late March or April, when changeable weather is likely. If conditions are favourable, the final cutting should be done before the dormant period begins. Some growth on the plants is desirable and cutting should be timed to allow them to recover so that root development will continue during winter.

A good cover on the stand in winter helps to some extent to suppress invading weeds. Any cutting after April is not recommended; cutting at that late stage, especially on areas subject to cold winters, will have a detrimental effect on the stand. The plants will be weakened and the first cut the following spring will be delayed. If weather is changeable, grazing is often preferable to late cutting.

—F. H. COLLIN



Effects of Noise on Tractor Drivers

By A. BELL,
formerly District Industrial Medical Officer,
Department of Health, Dunedin

IN the 1953 annual report of the Department of Health the Director of the Division of Occupational Health wrote: "One begins to wonder whether farming, besides being New Zealand's most important industry, is not also the most hazardous. The deaths from tractor accidents have received considerable publicity, yet they continue to mount. Few are aware of the large number of accidents of all kinds that put farmers and their workers out of action". The writer then briefly discussed the commonest causes of farm accidents and continued: ". . . the farmer seems to incur so many other risks. He handles more poisons than almost any other worker, what with insecticides, weedkillers, poisons for rabbits and other pests, sheep dip, and the rest. He is at risk from diseases due to contact with animals—hydatids, leptospirosis, undulant fever, ringworm—and from tetanus. He handles many substances that may cause dermatitis. . . ." Many other hazards could be added to this list. In this article the author discusses one in particular—the deafness caused by tractor noise. This is a by-product of farm mechanisation, and unless future tractors are quieter than present-day types, the incidence of this occupational disease will increase.

A RECENT local investigation disclosed that many tractor drivers were seriously and permanently deafened, but before describing this investigation the author discusses several important aspects of noise.

What is Noise ?

It is not easy to find a perfect definition of "noise". Possibly the simplest is to describe it as "objectionable sound". On some occasions, because of its intensity, noise is offensive, as, for example, the staccato "bark" of a nearby pneumatic road drill; on others relative loudness is the irritating factor. Every theatre-goer who has been disturbed by people rustling chocolates at the most dramatic

HEADING PHOTOGRAPH: Method of measuring tractor noise. Leeden photograph.

moment of a play will appreciate this point.

Measuring Noise and Deafness

Noise

The intensity of any noise can be measured by a noise-meter. The apparatus includes a microphone which converts sound waves into electrical currents; these subsequently pass into the instrument. Their intensity is measured by the degree of deflection of the meter needle from zero. The instrument is calibrated in decibels. A decibel is the smallest change in the intensity of sound which can be detected by a person with normal hearing.

The tractor noise was measured by placing the meter on a trailer and holding the microphone 2in. or 3in. away from the driver's ears while the tractor was in motion (see illustration on page 350). Readings were taken with different types of tractors pulling different loads and on flat and hilly ground. Recorded noise levels were between 80 and 95 decibels with occasional higher readings. Similar noise levels in local factories have caused occupational deafness.

Deafness

The degree of hearing loss can be measured by an instrument called "a pure tone audiometer" (see illustration on this page). The individual being tested wears a pair of earphones and by raising his finger indicates when he can no longer hear the noise generated by the instrument. By manipulating dials the technician can alter the intensity of the noise, cut out either earphone, or have both working simultaneously. The pitch of the noise (expressed in cycles per second) can be increased from 128 to 8192. The loss is expressed in decibels. A full examination involves testing bone and air conduction of both ears. In the survey of deafness in tractor drivers air conduction alone was tested at the farms; whenever an abnormality was found the driver was advised to undergo further detailed investigations.

When is Noise Harmful ?

Many factors must be considered before it is possible to give an opinion as to when noise is harmful. Some of the more important are:—

1. Intensity of the Noise

A. H. Davies in his book on noise said: "The nature of our sensation on hearing a sound is a complex reaction in which the actual loudness of the sound is unquestionably the chief factor in the production of the sensation of noise."

How loud must the noise be to be harmful ? The answer to this question is not clear-cut and authorities

EFFECT OF NOISE ON TRACTOR DRIVERS

Measuring the degree of hearing loss.

differ in their views. The general opinion is that noise consistently over 85 to 90 decibels is capable of damaging hearing. Other observers give higher or lower figures. One thing is certain—the louder the noise is the greater is the risk. A hazard is present if noise prevents hearing a raised voice at a distance of a foot. This is a good general rule.

2. Exposure Time

The longer one works at a noisy occupation the greater is the risk. After 3 or 4 years a person may notice slight impairment of hearing, but most seriously affected people have been exposed to noise for 10 to 15 years.

3. Character of the Sound Stimulus

(a) Periodicity of the sound: Repeated, sudden, loud, impact noises are as dangerous as continuous ones. As long ago as 1890 Dr. T. Barr wrote an article in the "British Medical Journal" headed "Injurious Effects of Loud Noises on Hearing". The author dealt in particular with injuries caused by the noise of railway whistles.

(b) Pitch: Many noises are a mixture of high and low tones. Because the sensitiveness of the ear varies with the pitch, shrill sounds are more harmful than deep ones.

(c) Other factors to be considered are the environment, previous ear trouble, and the mental make-up of the worker.

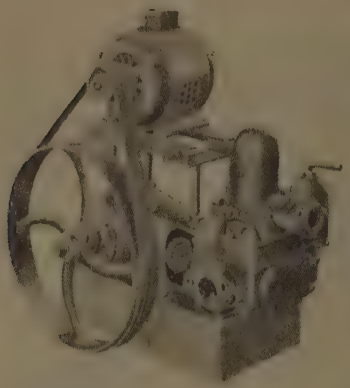
III Effects from Noise

Most authorities when discussing noise point out that there is an extraordinary range of aversions and tolerances; nevertheless, for decades there has been universal agreement that excessive noise is harmful. In 1930 the Noise Abatement Commission of New York wrote:—

> The noise of cities has become axiomatic. Thousands of people have learned to expect it as one of the necessary discomforts of gregarious living. They hear it under protest, and not without harm to their nervous system, their hearing, and their mental processes.

Many people claim that in time they get used to noise and that it does not affect them, but the writer does not consider that this is possible. Some individuals may partially adapt themselves so that they are barely conscious of the noise, but the irritation still has a cumulative effect.

Noise has always been associated with self-protective mechanisms. It produces mixed emotions of displeasure, anxiety, and fear. Centuries ago the cave-dweller was keyed up to fight when he heard the roar of wild beasts; today the psychological effect of blood-curdling war cries is well known. The heart beats faster, muscles tense for action, and move-



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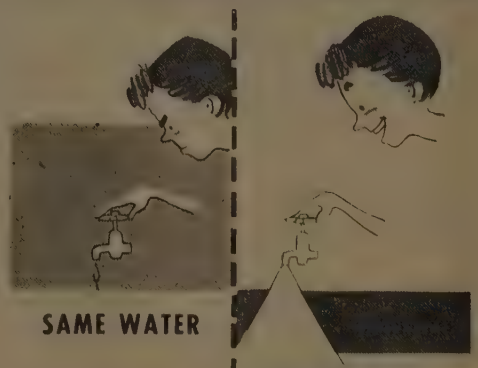

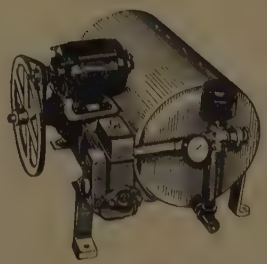

DAVIES

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ments become more energetic. This unconscious response is still present, but, naturally, to a less extent in those working in a noisy factory or on a noisy tractor. This automatic reflex is paid for in terms of increased energy expenditure and frayed nerves.

1. Deafness

Noise causes degenerative changes in the auditory nerve. This type of deafness is permanent and is less amenable to treatment or to the use of hearing aids than are other types such as middle ear disease. Many people do not realise they have a hearing defect because they have unconsciously learnt to lip-read.

An ever-increasing list of occupations is associated with high noise levels, for example, pneumatic drill operators, aeroplane pilots, stamp-press operators, and carpenters hammering in enclosed spaces. Many people think that no problem exists in New Zealand because the country is not highly industrialised. This view is incorrect. Three years ago the author examined 37 employees of a local engineering factory. The average age of the men was 44 and the average time they had worked in noisy occupations was 18 years. Of these men 19 (51 per cent.) had a considerable degree of hearing loss directly as a result of their work.

In the initial stages the loss is in the higher frequencies (in the region of 4000 cycles per second). Because these are of little importance in the hearing of human speech, the victim may for some time be unaware of any defect or, without realising the cause, may notice that he hears a man's voice much better than a woman's higher-pitched voice. As the condition progresses the hearing loss affects other frequencies and there is difficulty in discriminating between vowels and consonants.

The diagram on this page shows typical audiometer results. Compare the examples of increasing deafness (A, B, and C) with normal hearing.

2. Auditory Fatigue

There is a direct relationship between excessive noise and fatigue. Some authorities quote "train tiredness" for an example and point out how it is reduced if at the start of a long journey the ears are plugged with some material impervious to loud sounds.

3. Other Effects

Many other adverse effects are frequently attributed to noise. Some of these are:—

(a) A decrease in output (the reduction is greatest at the beginning and end of the day);

(b) A decrease in human well-being and morale;

(c) A higher accident rate, and

(d) Increased absenteeism and labour turnover.

Deafness among Local Tractor Drivers

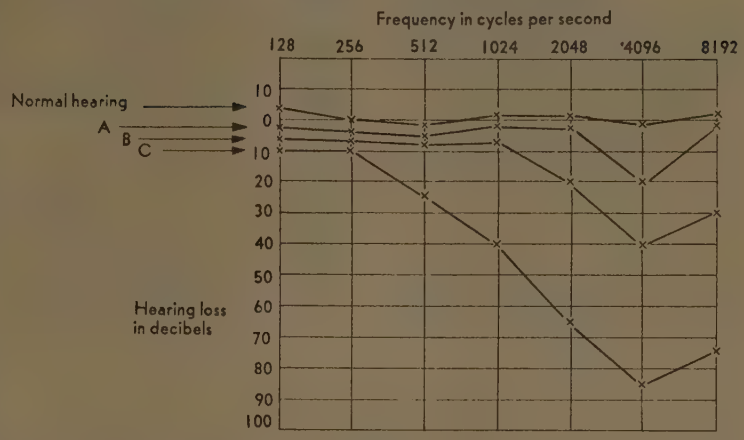
Recently a Dunedin ear specialist saw a patient with nerve deafness and was unable to account for it except on the basis of long exposure to tractor noise. To confirm his suspicion that such an occupational disease is possible the author and members of his staff interviewed and tested 28 tractor drivers on nearby farms, some of which were on hilly country. Table 1 gives group data.

In the time available it was not possible to see more men.

TABLE 1—AVERAGE YEARS OF WORK OF TRACTOR DRIVERS IN DIFFERENT AGE GROUPS

Age group (years)	No. of men seen	No. of years tractor driving		
		Maximum	Minimum	Average for the group
20-29	7	14	5	9.3
30-39	10	19	6	12.5
40-49	8	25	9	14.3
50-59	3	30	14	19.6
	28			
Average 37.6				14.0

EFFECT OF NOISE ON TRACTOR DRIVERS



Typical audiometer results, showing increasing deafness of A, B, and C compared with normal hearing.

TABLE 2—AVERAGE HOURS OF DRIVING

Age group (years)	Weekly average of driving hours at height of season	Duration of season (weeks)	Average of driving hours per man per year (approx.)
20-29	57	5	1,030
30-39	65	4	1,250
40-49	45	3	700
50-59	40	4	650

For many reasons it was not easy to obtain an accurate idea of the number of hours these men had driven tractors over the past few years. One obvious point emerged from the questioning; namely, that during the Second World War many worked longer hours than at present.

The above difficulties were borne in mind in the construction of Table 2.

For comparison an identical group of office workers was also tested. These men had never worked on a farm or in a noisy occupation. The results are shown in Table 3.

TABLE 3 — COMPARISON OF HEARING OF TRACTOR DRIVERS AND OFFICE WORKERS

	Tractor drivers' ears	Office workers' ears
Normal hearing	29	44
Slight loss of hearing*	11	5
Moderate loss of hearing†	4	5
Severe loss of hearing‡	10	2
	54	56

*Slight loss of hearing=maximum loss of 20 decibels in the higher frequencies, that is, 2048 and 4096 cycles per second.

†Moderate loss of hearing=loss of 20 to 40 decibels in the higher frequency range.

‡Severe loss of hearing=loss of 40 decibels or more in the higher frequency range.

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In classification of the degree of hearing loss the effect of age was ignored in both groups and men with a previous history of ear trouble, such as running ears, were regarded as unsuitable subjects. Men who had been driving tractors on the same day as the hearing tests were carried out were not included in the final figures. This was necessary to avoid biased results from temporary deafness which disappears within an hour or two after the exposure to noise ceases.

In all the affected tractor drivers the hearing loss was in the higher frequencies. Apart from one instance noise was the cause. For statistical purposes this man was discounted. Many of the men in the office control group had been in the Army and their hearing losses were probably caused by military service.

The results given in Table 3 were submitted to a statistician for analysis. The accepted (Chi square) test shows that the amount of deafness among these tractor drivers is significantly higher than in the control group. The test proves that the likelihood of obtaining such results by chance is only 1 in 200. The results of this small investigation strongly suggest that deafness among tractor drivers is an occupational disease.

The incidence of deafness for each age group can be seen from the graph on this page.

Protection of Drivers' Ears

There are two ways in which a tractor driver can protect his ears.

1. Reduce the Amount of Noise

Tractor noise is produced at many points and in many ways. Some of the factors concerned are:—

(a) Loose tracks.

(b) The condition of the ground—dry, hard, or rough country increases the noise.

(c) The position of the silencer.

(d) The different uses of the tractor.

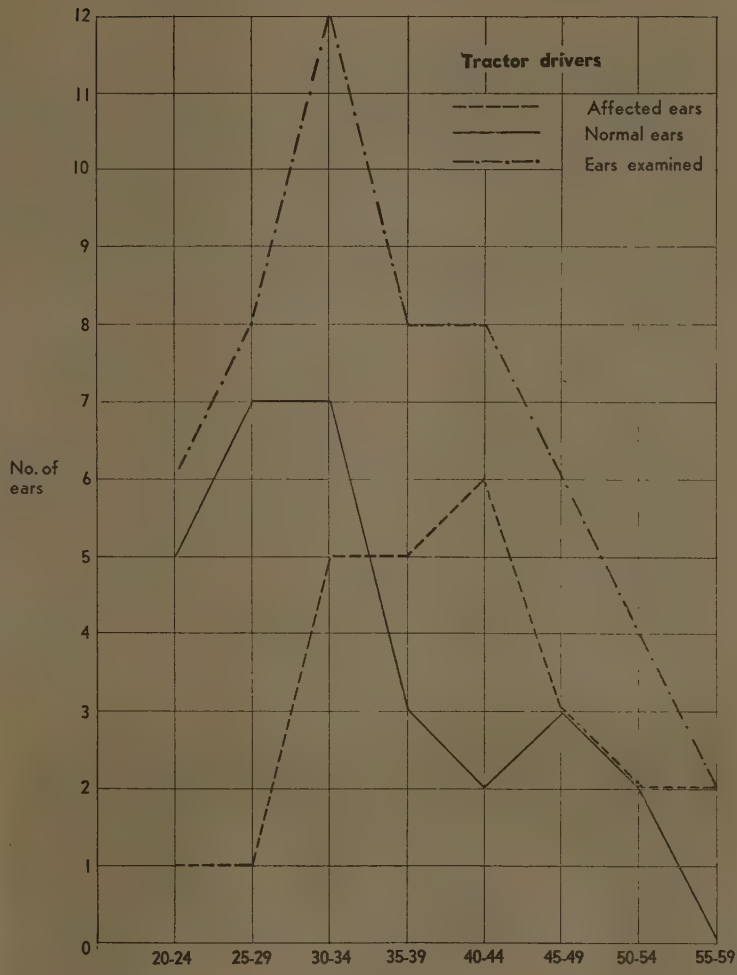
(e) Climatic conditions; for example, many drivers stated that noise appeared worse on a still morning.

If an enlightened farming community demanded quieter tractors, manufacturers would achieve considerable results by redesign. This is the most logical line of attack.

2. Wear Ear Defenders

Some types of ear defenders reduce the din reaching the ear drums by an amount equivalent to doubling or trebling the distance from the noise in the open air. All drivers of tractors, bulldozers, and graders should use them.

EFFECT OF NOISE ON TRACTOR DRIVERS



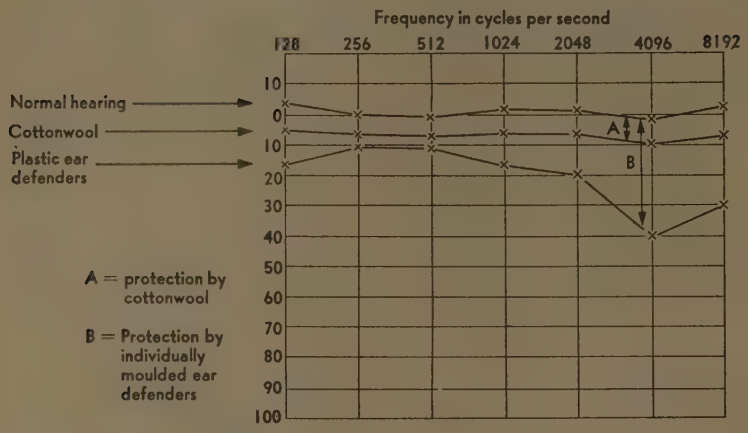
Incidence of deafness in each age group.

Types of ear defenders: There are three main types. In order of efficiency these are:—

(a) **Plastic defenders,** which give excellent protection (see A in illustration on page 356). These are the best type, as they are individually moulded to fit the creases and folds of the ear. Such ear defenders are made from a preliminary plaster-of-paris impression of the ear channel. Tests with an audiometer show that this type of defender excludes noise equivalent to 30 decibels or more in the harmful high frequencies (see diagram on page 356). Contrary to popular opinion many people can easily hear a conversation when they are wearing ear defenders in a noisy atmosphere. Plastic ear defenders cost about 45s. a pair; they last a lifetime.

(b) Small, inexpensive **rubber defenders** are available in different sizes (see B in illustration on page 356). Somewhat similar types have one or two fins on the end for insertion into the ear channel. These fins may be trimmed by scissors so that a reasonably tight fit is obtained. Some people are allergic to rubber and cannot use such plugs.

(c) **Cottonwool** lightly packed in the ears is better than nothing. With



Efficiency of different ear defenders.

cottonwool the intensity of noise reaching the ear drum is reduced by 5 to 10 decibels only. There is no selective protection in the higher frequencies.

With all types of ear defenders the closer the fit is the better is the protection, but the fit must not be so tight as to cause discomfort.

No matter which defenders are used they must be kept clean; otherwise dirt gathers in their folds and inflammation of the ears results.

Value of Precautions

Whatever the occupation there are associated risks. These invariably fall into two groups—those about which very little can be done to reduce the hazard, and those where the worker may considerably reduce the danger by taking sensible precautions. Deafness from tractor noise is in the latter category.

Deafness brings many burdens both physically and socially. Many writers have tried to describe these. Perhaps one of the most successful was Jonathan Swift (1667-1745), who wrote the following verse on his affliction:—

Deaf, giddy, helpless, left alone
To all my friends a burden grown;
No more I hear my church's bell
Than if it rang out for my knell;
At thunder now no more I start
Than at the rumbling of a cart;
And what's incredible, alack!
No more I hear a woman's clack.

Acknowledgments

The author thanks the tractor drivers interviewed for their help (their willingness to co-operate made the gathering of information very much easier); Dr. I. M. Rutherford for his friendly criticism and advice; Professor R. R. Nimmo, of the University of Otago, for lending the noise meter; Miss A. J. Smellie, Public Health Nurse (Industrial), for much of the time-consuming initial work; Mr. Spiers, statistician, Medical School, University of Otago, and Mr. Mair, of the Hearing Aid Clinic, Dunedin Hospital. The photographic department of the Medical School supplied the photograph on page 351.

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A. J. Fleming, C. A. D'Alonzo, and J. A. Zapp, "Modern Occupational Medicine", Kimpton, 1954.

A. H. Davis, "Noise", Watts (London), Ryerson (New York), 1937.

A—Plastic ear defenders. B—Rubber ear defenders.

Winter Show Dates

THE following are the dates and venues of winter shows:—

16, 17, 18, 19 May—Whakatane A. and P. at Whakatane.
*29, 30, 31 May, 1, 2, 4, and 5 June—Waikato Winter Show Association at Hamilton.
*31 May, 1, 2, 4, and 5 June—Otago A. and P. at Dunedin.
*13, 14, 15, and 16 June—Taranaki Metropolitan A. and P. at New Plymouth.
14, 15, 16 June—Te Kuiti and District Winter Show Association at Te Kuiti.
*26, 27, 28, 29, and 30 June—Whangarei A. and P. Winter Exhibition at Whangarei.

* The Department of Agriculture exhibit will be staged at this show.

Ruakura Farmers' Conference

The 1956 Ruakura Farmers' Conference will be held at the Department of Agriculture's Ruakura Animal Research Station from 12 to 15 June. The first day will be a special day for sheep farmers, a field day for all farmers will be held on 13 June, and 15 June will be a special day for dairy farmers. On 14 June subjects of interest to both sheep and dairy farmers will be discussed.

Oversowing Short-rotation Ryegrass into Pumice Pastures in Rotorua District

By C. R. TAYLOR,
Instructor in Agriculture, Department of Agriculture, Rotorua

IF one thing more than another tends to limit production from average pumice country farms of the Rotorua district, it is a weakness in the composition of their pastures which has the effect of severely restricting growth over the relatively long winter-early spring period. In other words they seriously lack sufficient ryegrass to bridge the gap in herbage production at this time. Because of this deficiency the practice of autumn saving of pastures for use later when the need is especially urgent has not always been particularly successful, the result being that a great deal more hay, silage, roots, and other supplements has often been found necessary than is normal in many other districts. Many attempts have, over the years, been made to introduce perennial ryegrass into otherwise good pastures by various oversowing methods using light surface cultivation, but few have met with any real success. Of more recent years, however, short-rotation (or H1) ryegrass has been used in place of perennial ryegrass with much better results. This article is based on the experience of several pumice country farmers who used no special or costly equipment to introduce short-rotation ryegrass into their pastures, and yet succeeded.

THOUGH the actual methods of oversowing short-rotation ryegrass have varied slightly from farm to farm, such differences are generally of little practical significance. On the other hand wherever good results have been obtained it has appeared fairly evident that certain basic principles governing plant life and habit have been reasonably well understood by the farmers and translated into practice. Thus it has been realised that short-rotation ryegrass does best when sown in autumn. Again the need of a relatively high level of soil fertility was not overlooked; hence short-rotation ryegrass was oversown only in those paddocks which had been well topdressed and managed and contained an adequate amount of strong-growing clover to furnish the necessary nitrogen.

There is a risk of seedling mortality resulting from oversowing a

HEADING PHOTOGRAPH: These pedigree dairy cows at Ngongotaha are largely supported by oversown short-rotation ryegrass. This property has produced nearly 270lb. of butterfat per acre and at the same time carried the relatively high number of young stock that is common on pedigree farms.

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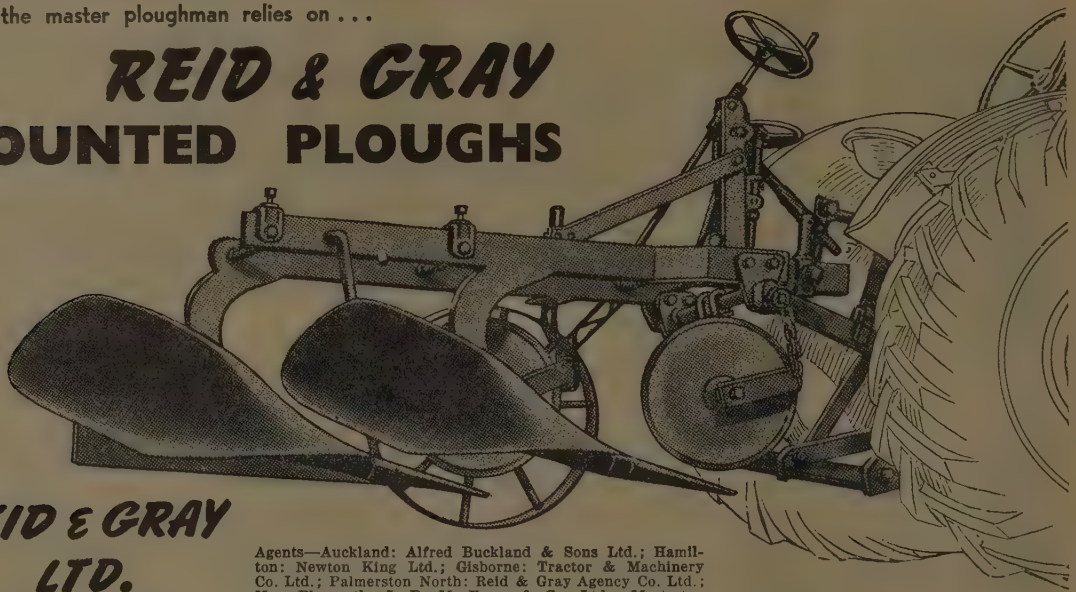

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comparatively small quantity of short-rotation ryegrass seed on an area already containing a much larger population of firmly established pasture species. This was guarded against by careful grazing management before and after oversowing and suitable surface cultivation to allow seed to enter the ground and so facilitate rapid and even germination.

What does all this involve in terms of work and expenditure for the ordinary farmer on average-quality pumice country of the Rotorua district?

Sowing Rate

Experience has shown that heavy expenditure on specially designed equipment has been unnecessary to secure good strikes or short-rotation ryegrass oversown into pumice land pastures, the usual discs or tripod harrows found on most farms being sufficient provided all other essential conditions are satisfactory. Various seeding rates have been tried over the past few years and generally the best results have been secured from an initial oversow of 5lb. per acre followed the next season with a similar sowing. From then onward circumstances will dictate whether or not more seeding is required. On some occasions none will be needed for several years, but on others a light sowing of 1lb. to 2lb. per acre every 2 years would seem desirable to maintain the short-rotation ryegrass at a profitable density.

Time of Sowing

The oversowing of short-rotation ryegrass is best done in autumn, when soil moisture and temperature conditions are most conducive to its growth. For all practical purposes it has been found that the period between mid-March and mid-April is usually ideal, for not only is the climate at this time eminently suited to the growth of the ryegrass seedlings, but the seasonal vigour of established clovers and grasses will have slackened considerably and hence offer far less competition to the young, establishing seedlings. Unfortunately the direct opposite applies to spring oversowings of short-rotation ryegrass, and it is substantially for this reason that so many failures occur when such are attempted.

The type of pasture eminently suited for oversowing with short-rotation ryegrass, showing the abundance of vigorous white clover and the relative paucity of ryegrass and other grasses. A high level of soil fertility and moisture is indicated.

The next point to be seriously considered in the oversowing of pumice land pastures with short-rotation ryegrass is the stage of growth of the pastures when oversowing is done. To be successful it is imperative that oversowing be attempted only on a **hard-grazed** pasture, for in no other way can a seed-bed be prepared which will ensure the oversown seed entering the soil and not becoming hung up in a mass of vegetation to perish. Neglect to observe this fundamental requirement has probably been responsible for more failures than all other causes. Moreover, a severely grazed pasture, especially in the colder regions of the country, during March-April takes time to recover, and this definitely favours seedling establishment.

Part of an adjacent and once similar paddock to that shown in the upper illustration. It was oversown in short-rotation ryegrass 3 years before. The value of such growth in late winter and early spring is obvious.

Cultivation

When the selected paddock has been severely grazed the next step is cultivation. The soil under a pasture that has been consistently trampled by grazing animals over the hot, dry months of summer becomes fairly dry and hard by autumn. Seed oversown in such circumstances and without some prior soil treatment would stand little chance of survival, even though much of what birds had left might germinate after a good shower of rain. To obviate this the surface crust must be partly broken up before seed is distributed. Experience has shown that very good results may be obtained by lightly cultivating pumice country with discs set with very little cut but weighted sufficiently to leave an impression about 1in. deep, or with a reasonably sharp set of tripod harrows (short ends down). Ordinary tine harrows, particularly those capable of being mounted to the hydraulic-lift system of a tractor, are also suitable for this purpose.

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Regardless of the actual method of cultivation, however, the principal idea in oversowing is to get the seed into the soil and covered to a reasonable depth without the need for such drastic surface cultivation as would literally tear a pasture to pieces, severely check its growth, and encourage weeds. One highly successful oversower of short-rotation ryegrass (who practises strip grazing almost the entire dairying season and harrows immediately after grazing a paddock) makes a practice of hand sowing a few pounds of short-rotation ryegrass each autumn immediately after a field has been strip grazed and then very thoroughly harrowing dung and seed into the ground. The dung helps in no small measure to cover the seed and provide nutrients to the young seedlings. This method has proved most successful.

A paddock of bare ground, flat weeds, and inferior grasses such as this is entirely unsuited to oversowing with short-rotation ryegrass. Dry conditions and a naturally droughty soil have combined to eliminate most clovers and other useful species. →

For the most part short-rotation ryegrass is oversown after light surface cultivation. It is then customary to harrow again after oversowing to cover the seed. In some instances, however, results have been quite satisfactory from the practice of oversowing first on to a hard-grazed pasture and then harrowing fairly drastically. Where this method has been successful it is usually associated with an above-average level of soil fertility and adequate rainfall when the work was done. A Cambridge rolling will sometimes follow oversowing, often with good results, especially if the soil is rather dry and loose. Though seed for oversowing is generally mixed with the autumn topdressing, thus avoiding two operations, it is also put on by hand to some extent, as mentioned in the last paragraph.

Severe grazing before surface cultivation and oversowing is essential to a successful strike of short-rotation ryegrass. Thereafter grazing management should be neither too drastic nor too lenient. The photograph was taken about a week after the field was oversown. →

Successful oversowing of short-rotation ryegrass has resulted from the hand sowing of seed into a closely grazed, well-dunged pasture which was then harrowed thoroughly (double cut) to spread the animal manure and provide a seedbed for the ryegrass. This is a cheap and often effective method under the right conditions. →

Oversown short-rotation ryegrass with other pasture species surplus to the immediate needs of stock at mid-spring makes very good silage for later use. Shown here is the completion of a 150-ton trench-type silo filled to capacity with herbage chopped by a forage harvester. Forty per cent. of the material is short-rotation ryegrass.

Rarely in the Rotorua district does oversown short-rotation ryegrass make appreciable growth in the first 12 months after sowing. Because of this many farmers have early concluded that their work and the expenditure have been wasted, only to find that in the second winter and spring the picture is very much brighter, and in time, with good management, the improvement continues. The resultant additional pasturage available at a critical period represents a material boost to animal production while relieving the farmer of much anxiety.

However, benefits are seldom possible without at least some measure of temporary inconvenience, and success with oversowing short-rotation ryegrass into relatively short-season permanent pastures on pumice country is no exception. Therefore extreme care is necessary to see that a newly oversown paddock is not so overgrazed that stock pull out many seedlings and is not so undergrazed that the seedlings are smothered by the growth of established species.

Between these extremes there is a happy medium which will be appreciated by the majority of practical farmers once their attention has been drawn to the need for this type of management. To do the right thing in grazing management has not been found difficult, but it is essential that it be done.

For this reason it is considered unwise to tackle too large a part of the farm at one time. It is generally preferable to oversow a few paddocks each year and do the job really well.

Selection of Pastures

Notwithstanding the importance of these requirements the first and most important point for consideration in oversowing short-rotation ryegrass into pumice country is care in the selection of the paddocks to be oversown. Very many failures and disappointments have been caused by neglect in this direction. Not every paddock on every farm is suitable for sowing short-rotation ryegrass in the normal way, let alone by the much less certain process of oversowing into an established pasture.

Before it will thrive short-rotation ryegrass, in common with perennial and Italian ryegrass, **must** have high or relatively high soil fertility. This soil condition requires the availability at all times of adequate moisture and plant nutrients, **especially nitrogen.** Pumice land pastures established on droughty soil types—of which there are extensive areas in certain districts—do not hold clovers well owing to lack of sufficient soil moisture over the dry months of the year. In these circumstances it is virtually useless trying to establish short-rotation ryegrass by oversowing, as both soil moisture and nitrogen become limiting factors regardless of other management practices which could well be of the highest standard.

On the other hand there are large areas of pumice country in the Rotorua district capable of retaining reasonable amounts of moisture over long periods of dry weather and where clovers grow most luxuriantly. These are the conditions under which short-rotation ryegrass can be expected to do well and it should, therefore, be sown in permanent pasture mixtures as well as oversown. Provided careful thought is given to the natural requirements of short-rotation ryegrass, there should be no difficulty in selecting areas on a great number of pumice land farms capable of giving these minimum requirements. If the subsequent treatment suggested in this article is given, there seems to be no sound reason why the oversowing of short-rotation ryegrass should not prove an outstanding success and profitable investment.

The position regarding the introduction of short-rotation ryegrass into pumice country pastures by oversowing may be summarised as follows:—

1. Success has attended a large proportion of oversowing done properly in circumstances that suit the natural characteristics of short-rotation ryegrass. These farmers have found that the normally difficult feed position of late winter and early spring has been substantially overcome by the lush growth short-rotation ryegrass produces at this time.

2. Short-rotation ryegrass is best oversown from mid-March to mid-April.

3. The area to be oversown must be grazed severely before surface cultivation and seeding.

4. Surface cultivation must be sufficiently intense to form a reasonably good seed-bed. Close, dense pastures will require more working than open swards. Ordinary discs, tripod harrows, and similar cultivating equipment have been satisfactory implements in light pumice country.

5. Initial seeding rates average approximately 5lb. per acre, followed the next autumn by a similar dressing. Subsequent treatment will depend on the position then obtaining, some farmers preferring to continue with sowing a pound or two each year. Often oversowing is combined with autumn topdressing.

6. After oversowing close attention to grazing management is imperative. This must not be too severe or too lenient.

7. To avoid management difficulties too great a part of the farm should not be oversown in any one year.

8. Avoid oversowing pumice country deficient in soil moisture and nitrogen. Where clovers do not grow freely for the greater part of the year it is hardly likely that short-rotation ryegrass will thrive.

Tree Planting

IF trees are to be planted this winter, preparations should be well in hand this month. Farm tree planting requires as much if not more planning than many other farm operations, because mistakes may take longer in becoming apparent and much valuable time may be wasted. This article by W. H. Jolliffe, Forestry Extension Officer, New Zealand Forest Service, is designed to help the intending tree planter. The article is the thirteenth in a series on trees on the farm which was begun in the March 1955 issue of the "Journal".

BEFORE planting there are several matters requiring action or consideration. Arrangements will have been made some time ago for the requisite number of plants of species suitable both to the farmer's needs and to the conditions of the site. The area must be fenced against stock and vermin; if the land is not clear of tall weed growth, lines must be cut through it at the required spacing; and the various restrictions on planting or on the results of planting in certain places must be considered and observed.

These restrictions are written into several statutes. The Noxious Weeds Act provides that some tree species may be declared noxious in any locality and under other legislation a property owner may be required to cut down or trim trees alongside or near roads, power and telephone lines, and aerodromes. Before trees are planted along a boundary the written consent of the adjoining owner must be obtained.

Spacing

The numbers of trees required per acre for various spacings are:—

Distance apart ft.	No. of trees per acre
6 x 6	1,210
8 x 8	680
10 x 10	435
12 x 12	302

Spacing of planting may vary from say 6ft. x 6ft. to 12ft. x 12ft. according to the purpose for which the trees are grown, to the species, and to the likelihood or otherwise of any further treatment being given. Generally the closer spacings are preferable, because a continuous leafy canopy is formed at an earlier age. This results in earlier suppression of weed growth, the improvement of the climate close to the ground, the early suppression of side branches (which are thus kept small), and the incentive to increased height growth. However, close plantings must be followed by early thinnings to avoid the formation of a forest of tall, thin, whippy trees interspersed with numerous dead or dying ones.

Wide spacing (10ft. to 12ft.) results in slower formation of a continuous leafy canopy. This means that height growth is not so fast (though stem diameter growth is hastened) and side branches grow unrestricted unless removed by pruning. However, where thinning is not possible it is better to accept these disadvantages than to have the stagnation of an unthinned, densely packed plantation.

Planting

The season for planting usually ranges between May and September according to the climate and the locality. In mild climates the earlier months are generally preferable and vice versa.

The main points in planting are to see that the roots are directed downward and not bent unnaturally; to insert plants to the same level they were in the nursery; to fix the plants firmly in the ground and see that the roots are not hanging in an air pocket; and to keep the roots of young trees moist at all times from lifting from the nursery to planting in their final situation. Time taken in grubbing away a dense mat of grass and in pulverising the soil to the full depth of the grubber blade will be time well spent. It is much better to plant fewer trees well than a lot of trees poorly and have to fill in later blanks where trees have not survived.

The best general tree-planting tool is the grubber or mattock. In free soils such as pumice, sand, or sandy loam a spade may be preferred; in very stony land a tool shaped like a spear with an expanded head will be found a great help.

Wrenching and Lifting Young Trees

Wrenching and lifting are practices which should be carried out carefully by farmers who raise their own planting stock.

Because a long taproot can suffer serious damage during transplanting, it has become general practice to cut it back at a time that permits growth of a system of fibrous rootlets before the tree is moved. The operation is known as wrenching and is performed by driving in a sharp spade on each side of a band of trees at as flat an angle as possible to cut all the taproots at about 4in. below the surface. The spade handle is then pressed down to raise the clod of trees clear of the bed and then the clod is let back into its old position by the removal of the spade. This operation is repeated for the full length of each of the bands. The job is easier if two men with spades are available to work on either side of a row simultaneously.

Wrenching is normally done after heavy rain 2 to 3 months before planting is intended. Wrenching may also be done to check too rapid growth which would result in unwieldy planting stock.

Lifting is done with a spade, preferably after rain and on an overcast day. The loosened clod is lifted out by a firm grasp of all the trees rising from it. The soil is shaken from the clump and then the individual trees are carefully disentangled, culled, and bundled into lots of handy size. In culling, care should be taken to reject all poorly rooted plants, those lacking a healthy colour, and those which have no definite leading shoot. It is better to lose plants at this stage than after labour has been spent on planting out unthrifty stock.

If trees cannot be sent direct to the planting ground, the roots must be puddled in a mud bath about the consistency of gruel and the bundles heeled in in a sheltered place. Plant roots must be kept moist from the time of lifting from the nursery to the time of planting in their permanent location.

▼ Wrenching young pine trees in a nursery.

LIME AND PHOSPHATES

THESE notes discuss the practices of liming hill country and topdressing land which has had a long history of phosphate topdressing.

TRIALS ON MANAWATU HILL COUNTRY

ON New Zealand hill country the most essential fertiliser is phosphate, but there are extensive areas where lime applications are required to obtain the greatest response to phosphatic fertilisers. Though many farmers are aware of this, the question of whether to lime or not has been mainly an individual problem based on locality, topography, access, availability of spreading equipment, and costs of application. In the past it has been generally supposed that lime should be applied at fairly heavy rates to give worthwhile results. With long hauls, high carting costs, and difficulties of spreading, liming has consequently not received much support from many farmers in back country areas. Recent trials in the Manawatu have shown, however, that lime used at low rates will give good results provided phosphate has also been recently applied. As lime can be spread satisfactorily and economically by aeroplane, its use can now be recommended on a large area of hill country where previously it could not have been contemplated, and already a substantial acreage has been treated in the district.

OBSERVATIONAL TOPDRESSING TRIALS

During the past 3 years a large number of observational topdressing trials have been carried out on most of the major hill country soils in the Manawatu. These have included various forms of phosphate, molybdenum, and lime, usually at both 1 ton per acre (one application) and at 3cwt. per acre (annual applications). The results have shown that though phosphate deficiency is the main fertility factor limiting production, maximum benefits from the phosphate can be obtained only when lime is used as well. Superphosphate has generally been the best form of phosphate. It invariably gives moderate to fairly good responses when used alone, but where lime has also been applied the results have been excellent. Responses to lime have usually been quick and definite, and though initially the 1-ton dressings have been superior to those of 3cwt., responses to the latter after the second annual application have been about equal to the former. Molybdenum responses have been very variable, but are generally much better where this element has been used in conjunction with light applications of lime as well as superphosphate.

The liming of Manawatu hill country requires still further investigation, particularly in regard to the most economic rate of application, but results to date are sufficiently conclusive to warrant recommending the use of lime on hill country farms in the following localities: Shannon, Tokomaru, Fitzherbert West, Aokautere, both sides of the Pohangina Valley, Apiti, Rangiwahia, Kimbolton, Waituna West, and Onepuhi. The Te Awa and Rewa districts have not been fully investigated. New trials with lime at varying rates and frequency of application are being laid down and some early results indicate that 5cwt. per acre may possibly be the best rate for the initial dressing.

—J. A. GRAHAM

PHOSPHATES IN WAIKATO AND TARANAKI

ON the soils derived from volcanic ash in the Waikato and Taranaki districts phosphatic topdressing has been routine for many years on most farms, being curtailed by temporary shortages only during and immediately after the war. From chemical analyses it seems clear that the applied phosphorus is firmly held by the soils under discussion and does not move downward in the profile to any extent. It stays in the few top inches, that is, in that part of the soil from which pasture plants are thought to derive the major part of their nutrients. As applied phosphorus is so little prone to movement in the soil, it could be expected to exhibit a very high residual value. This is in fact the case on many soils in Britain, Australia, and other countries, and may be true for a large number of soils in New Zealand. On the soils of the North Island, however, which are derived from volcanic ash, responses to superphosphate can be measured and seen in fields which have been topdressed generously with this material for many years. Yet even on these soils the residual value of past applications of phosphatic fertilisers cannot be insignificant.

NEED FOR TRIALS

For this reason an assessment of the value of continued phosphatic topdressing is topical, particularly on those farms on which potash is regularly required, as potash topdressing by itself imposes an unavoidable financial strain. A series of mowing trials were begun 2 to 3 years ago to measure the effect of different rates of superphosphate or serpentine superphosphate on fields which had been heavily topdressed with phosphates in the past. In 1954 a total of nine such trials were conducted by the Department of Agriculture in the Waikato and in Taranaki. Only periodic production cuts have been possible in some trials and this has meant in some cases that the important measurements within 6 months after topdressing are not complete.

RESULTS OF TRIALS

Though the trials have only run for 2 to 3 years, results have been striking enough to deserve a short summary.

1. Where previous phosphatic topdressing was heavy responses to superphosphate, if any, seem confined to late autumn and winter. Such a result would not be surprising if superphosphate had been applied in every case just previous to the time at which responses were measured or seen. In the four trials, however, which were topdressed in spring no growth responses occurred until winter.

2. The absolute magnitude of the responses was small, as could be expected at that time of the year, but the relative magnitude of responses was sometimes quite large. Responses were clearly visible.

3. On those fields which had regular dressings of phosphate in the past the efficiency of superphosphate in stimulating growth during late autumn and winter does not seem markedly lower at high rates of application (6cwt. per acre) than at low rates of application (2cwt. per acre), if measured as quantity of growth increases per 1cwt. of fertiliser applied.

4. Whether phosphatic topdressing pays under such conditions depends largely on the importance to individual farmers of small increases in pasture production during winter and late autumn.

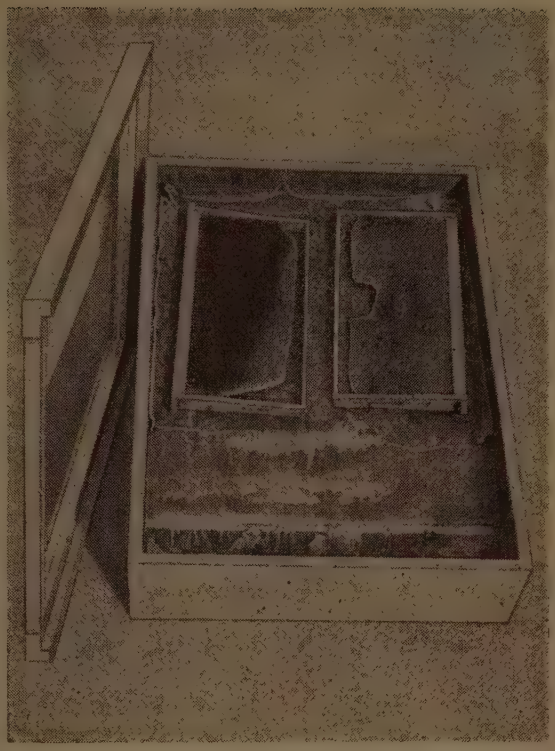
—C. DURING and G. BLAKE

Production of Beeswax

Seasonal Notes for the Domestic Beekeeper

THOUGH the production of beeswax is largely incidental to the keeping of bees for honey, the wax has a sound commercial value which is often overlooked by inexperienced beekeepers. Apart from the manufacture of comb foundation, beeswax has many other commercial applications and when properly rendered down it meets with a ready demand. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses some of the more simple methods of reclaiming wax which will enable the smaller beekeeper to produce a saleable article economically.

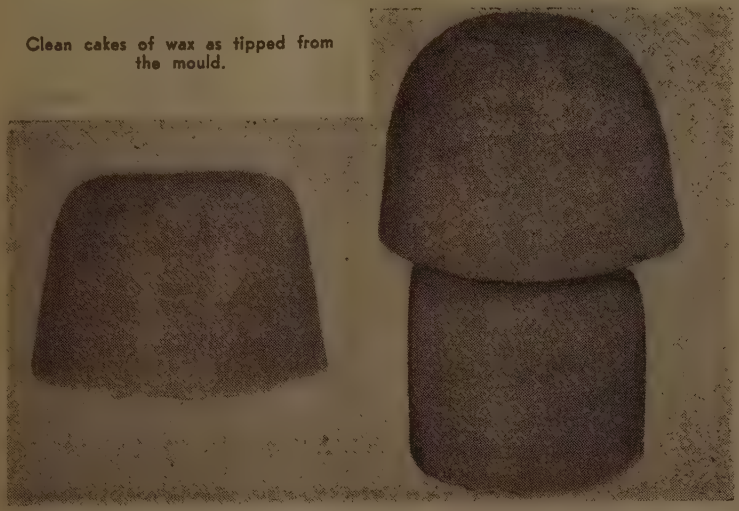
THOUGH the production of wax is essential to the existence of the honey bee colony, the amount of wax produced is many times less than the amount of honey obtained. Beeswax is produced in quantity in commercial beekeeping, and much attention has been given to the development of equipment designed to produce high-quality wax with a minimum of loss and waste. Much of this equipment is costly to buy or build and in addition is usually designed solely for the production of wax in quantity. Beginners and beekeepers owning only a few hives who are not familiar with the simpler methods of wax reclamation may feel that the equipment used by full-time commercial beekeepers is too costly and involves too much time and trouble in construction to be worth while. In consequence, much valuable wax may be wasted in the course of a season. If all the pieces of burr and brace comb and hive scrapings which are removed from each colony during a season are carefully salvaged, a considerable amount will be accumulated at the end of a year.



A home-made solar wax extractor. [*Morgan*

In addition to these scraps of wax which are so often wasted during hive manipulation there is a valuable source in old brood combs, of which a number usually require replacement annually. Culled combs, brood or otherwise, with the cappings from extracted honey are the beekeepers' most important source of beeswax.

Because comb cappings usually contain little or no foreign matter, the wax from this source is generally of the best colour and finest quality. Old combs, burr comb and frame, and hive scrapings are generally discoloured and contain much propolis and other resinous material. Combs which have been used for brood rearing in addition to propolis and resin will also contain the cast-off skins of larvae and some proportion of pollen. This foreign matter will discolour the wax, no matter how much care is taken in refining, and it is essential that all comb which is discoloured or has contained brood or pollen should be rendered separately from clean comb and cappings if a high-grade product is to be obtained.



Clean cakes of wax as tipped from the mould.

Though the methods employed in separating beeswax from impurities are many and varied, all are based on the melting point, low specific gravity, and insolubility of beeswax in water. Beeswax melts at a temperature of 143 to 148 degrees F. It is lighter than water, having a specific gravity of 0.96 as compared with 1.0 for water. Because of its lower specific gravity and its insolubility, beeswax when melted in water floats on the surface and can be drawn off separately. These peculiar properties of beeswax make it possible for beekeepers to reclaim a great proportion of their wax. The simpler methods are not as efficient as the more elaborate means used in quantity wax processing, but, if intelligently applied, will

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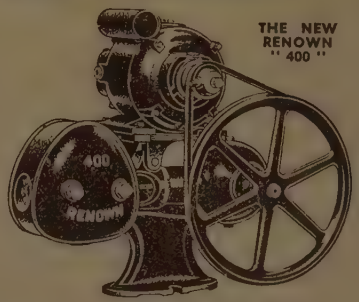

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enable reclamation of a sufficient proportion of the wax to justify the work involved.

Rendering Combs and Cappings

Before proceeding with any method of rendering beeswax the beekeeper should consider the fire risk involved. Melted beeswax is highly inflammable and unless a fire-proof room is available the work should be undertaken only in the open well away from buildings or any collection of inflammable material.

If the material to be rendered consists of old brood and other discoloured combs, it should be soaked in soft, warm water for at least 24 hours before it is processed. This will soften much of the foreign material such as pollen and cast-off skins of larvae and allow it to separate much more freely. All simple methods of wax separation require hot or boiling water. Water containing minerals, or hard water as it is sometimes called, may cause the wax to become saponified. All water used in wax processing should be as free of minerals as possible. If rain-water is not available, the addition of a cup of vinegar to every 5 or 6 gallons of water will help considerably.

A 60lb. honey tin or a similar container such as a small drum will be an adequate receptacle when only a few combs are to be rendered. Cut the top out of the container, turn the edge over neatly, and fit a strong wire handle. Next cut a piece of stout board at least 1in. thick to a size that will fit neatly inside the container and yet move freely up and down. A series of ¼in. holes 1in. apart are then bored in the piece of wood. An empty 70lb. sugar bag or a piece of scrim should also be secured. The bag or scrim must be well washed before use. The combs to be treated are then cut out of the frames, squeezed into compact lumps, and placed in the bag or wrapped in the scrim. No more comb than will half fill the container when placed in the bag should be used at one time.

When the container is half filled with the bagged comb soft water is added until the container is filled to within 4in. to 6in. of the top. The container is then heated until the water boils. The water should be kept gently boiling for at least ½ hour. While boiling is in progress the bag of comb should be gently moved about a few times with a clean piece of wood. The container is then lifted off and the piece of perforated wood placed on the top of the contents. Pressure is applied to the board by use of a motor-car jack or a lever and fulcrum. This pressure frees much of the wax, which floats to the surface, where it is skimmed off and poured immediately into another container of very hot water. Pressure should not be continuous, but should be released occasionally to allow the hot water to penetrate the bag of comb again.

If all the wax has not been released before the water starts to cool, the container should be brought to the boil again and the pressing repeated. The skimmed-off wax should be remelted in clean water and then poured into moulds and allowed to cool gradually. Slow cooling allows impurities to sink to the bottom of the wax before it solidifies. They can then be easily scraped off.

Cappings from extracted honey will of course contain a great deal of liquid honey. If the honey is heavy bodied or the weather cool, the cappings will not drain freely and sufficient honey may be retained to cause a granulated appearance in the wax when the cappings are melted. If cappings cannot be well drained or otherwise cleaned of most of the honey, double the quantity of water should be used and the boiling should be very gentle. It is always advisable to use more water when melting comb cappings than is required for combs.

Where only a few pounds of cappings need to be cleaned of honey the bees can sometimes be safely used to clean up the excess. The cappings must not be placed in the open where flying bees have free access, but should be given to one or two strong hives to deal with.

The following method will generally result in small amounts of cappings being thoroughly cleansed. A strong hive is selected, care being taken that all boxes, lids, and the floor are sound and bee-proof. The lid is removed and an inner cover board placed on the top super. This cover board should have a 1in.-diameter hole in one corner only. An empty super is placed on this and the cappings spread out over the inner cover board. The hive lid is then replaced. This work should be done in the evening when the bees have ceased flying and should never be attempted when robbing is prevalent.

The bees will come up through the 1in. hole and gradually carry all the honey down to the lower chambers. The lid should be lifted occasionally in the evenings and the cappings stirred with a stick. This will enable the bees to clean up the honey much faster. When the cappings are reasonably dry they can be processed in a similar manner to the combs. If there is any doubt about the health of the colonies from which the extracted honey was taken, this method should not be used.

In the treatment of any form of wax the containers used for heating and melting should be tinned or well galvanised or be made of copper. Unprotected iron tends to discolour the wax badly.

Solar Extractor

Beekeepers who are handy with tools and interested in woodwork can, at little cost, easily construct an appliance which will greatly simplify wax reclamation in the small apiary. This is known as the solar wax extractor. The extractor is a shallow wooden tray lined with black iron and covered with a sash fitted with double glass. It is provided with a pair of legs on one end so that it tilts at an angle of 30 to 35 degrees. It is stood in a sunny corner of the apiary and placed so that it faces toward the sun. When the sun is shining very considerable heat develops in the extractor, where burr comb, scraps of wax, dry cappings, and old comb are readily melted. Even brood combs will yield a considerable return of wax in the warmer part of the year, though the residue from these should always be further processed by boiling if the maximum yield of wax is to be obtained.

Because of the considerable heat developed the solar extractor must be substantially constructed. The timber used should be well seasoned and not less than ⅞in. thick. All corners and the joints of the sash should be reinforced with steel strapping. For the small home apiary the solar extractor described below should be large enough. The extractor is made in the form of a stout wooden box 4ft. long, 2ft. wide, and 6in. deep inside measurement. This is covered by a hinged sash fitted with two panes of glass not less than ⅛in. and not more than 1in. apart. The box is lined with a black sheet-iron tray made to fit loosely. The edges of the tray are turned up about 2in. and one end is tapered, leaving an opening 6in. wide. The tray should not be more than 3ft. 6in. long so that a container can be stood at the open end to catch the melted wax. The black iron tray should be stood on brackets so that the bottom is not more than 2½in. below the inner glass of the sash.

The receptacle for catching the melted wax should taper from the top to the bottom so that the wax can be easily removed when it is solidified. To be efficient the solar extractor must be made with close fitting joints to prevent escape of heat and the possible entry of robber bees.

With a solar wax extractor in use it is a simple matter to place all bits of comb gathered during hive manipulation into the extractor before leaving the apiary. The wax is automatically reclaimed and the problem of storage and prevention of wax moth damage is eliminated. Cappings that have been well drained or cleaned up by the bees can also be satisfactorily treated in this extractor.

Irrigation in Australia

By G. K. McPHERSON,
Irrigation Research Officer, Department of Agriculture, Winchmore

MORE than two-thirds of the land area of Australia has an annual rainfall of less than 20in. Coupled with this relatively low rainfall is an extremely high evaporation rate due to the very high temperatures throughout summer. As a result plant growth is restricted over large areas of the country to low-producing species. Stock-carrying capacity of much of the land is naturally low and holdings to be economic have to be relatively large. Under such conditions the thoughts of farmers and others interested in primary production naturally turn to irrigation. In the last 50 years in Australia, particularly in New South Wales and Victoria, large areas of the country have been brought under irrigation with the objective of increasing primary production.

GRASS is the main crop irrigated. Almost two-thirds of the area under irrigation consists of pasture. In 1952 the area of the various crops irrigated was as follows:—

	Acres
Pasture	929,889
Rice	35,589
Vegetables	70,170
Vineyards and orchards	155,744
Sugar cane	54,566
Other crops, including fodder, and fallow ..	230,947
	1,476,905

Climate

The two main features of the climate under which irrigation is practised are a relatively low rainfall and a high evaporation rate. Central Gippsland, with an average annual rainfall of 22in., is the highest rainfall area in either New South Wales or Victoria where flood irrigation is practised. The main irrigation schemes, however, are situated in areas where the average annual rainfall varies between 14in. and 18in. Details of the climate in the Murrumbidgee irrigation area are as follows:—

Rainfall: 15in.; distribution is erratic and unreliable, though over long periods the monthly average is somewhat the same. The summer rain usually takes the form of storms, with the winter rain of a drizzling nature.

Frosts: These occur from late May, extending through June, July, and August, and occasionally until late October. The heaviest frosts approximate 19 degrees with the average varying between 6 degrees and 12 degrees.

Summer temperatures: December, January, and February are very hot and dry. The mean maximum for December approximates 85 degrees, for January 89 degrees, and for February 88 degrees.

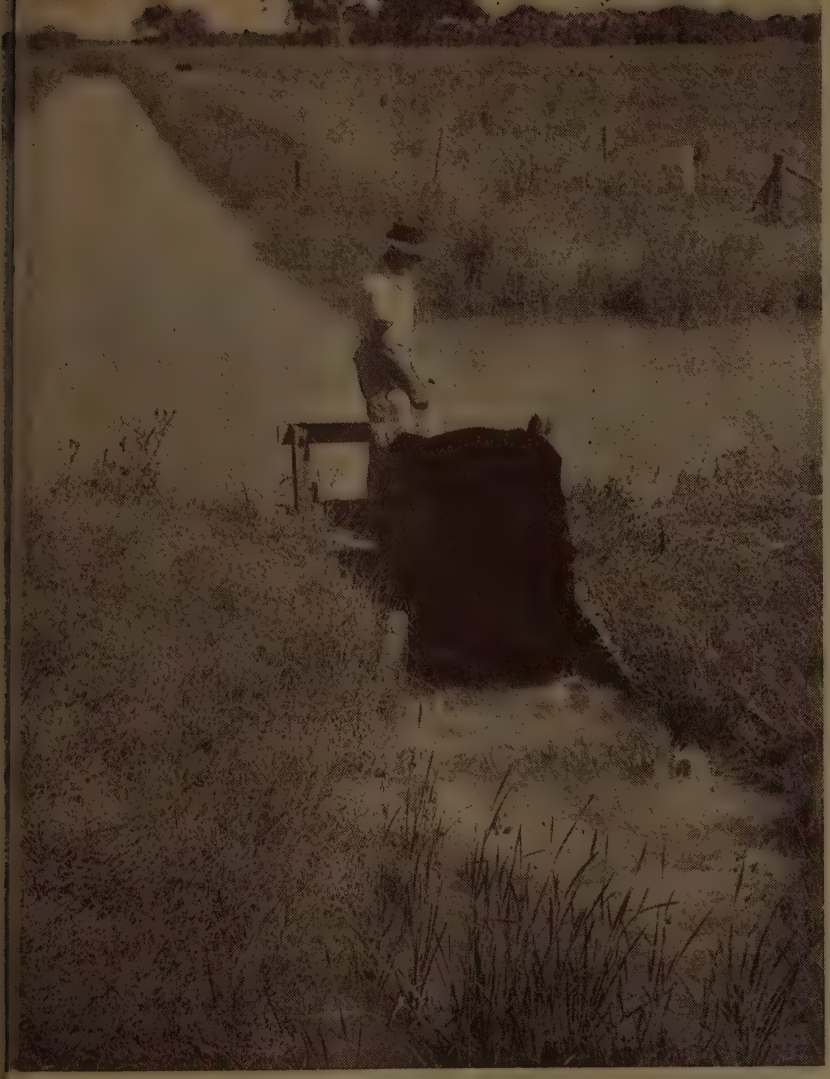
Summer humidity: Daytime humidity varies between 20 per cent. and 30 per cent. and that at night is about 60 per cent.

Mr. G. K. McPherson, who is in charge of the Department of Agriculture's Winchmore Irrigation Research Station. Last year he visited Australia to attend conferences on irrigation and to inspect irrigation schemes. This article gives some of Mr. McPherson's impressions.

Soil Types

A great deal of the land where irrigation is practised in Australia is extremely flat. Some areas where the slope is as small as 0.05 per cent. have been prepared for irrigation by the border check method. The soils vary from a permeable sandy loam type to a heavy clay where the infiltration rate is extremely low. Where irrigation is practised in Canterbury there is usually 15in. to 20in. of soil and subsoil on a bed of shingle. No soil types of this kind were seen in Australia. Australian soils generally were much less permeable than most of those in Canterbury.

▼ Main irrigation canal at Yenda, 12 miles from Griffith, New South Wales. Australian Official Photograph.



[*Australian Official*

Water being diverted from a canal on to a farm at Tongalla in northern Victoria. The water is measured through a Dethridge wheel.

Systems of Land Preparation

There are four systems of land preparation in Australia: (a) Border check (referred to in Canterbury as border dike). (b) Border ditch. (c) Contour bay. (d) Wild flooding.

Of the four systems the border check is the one most commonly used. It is the form of land preparation practised where the slope of the land varies from, say, 3.75 per cent. down to 0.12 per cent. It has the advantage that it is the most economical in the use of water. Investigations are still in progress regarding the ideal width and the ideal length of borders for most efficient irrigation, but no finality has been reached on these two important factors.

On one state developed scheme where the slope down the border was greater than 6in. per chain the width of the checks was restricted to 22ft., or three per chain. With flatter slopes a width of 33ft. was common and in some cases up to 66ft. was stated to be satisfactory. Generally, however, it was considered that the wider checks gave less-efficient irrigation.

The border ditch system is popular in some parts of New South Wales, but is not used in Victoria. It is really a modification of the border check method. Instead of levees, small ditches are run in the direction of maximum slope. Each bay or check is provided with a head-gate as in the border check method, the ditch merely being used as a levee and to remove surplus water. The ditches are usually spaced at 2 to 3 chain intervals and the checks are made 10 to 20 chains long, depending on grade, permeability, and water supply. This system of land preparation is used for pasture growing in the Riverina and can be practised only on very flat land.

Rice growing combined with pastures for sheep grazing is a very popular rotation in the Murrumbidgee irrigation area, and the method of land preparation in this area is known as the contour bay system. Banks approximately 18in. high at a maximum of 3in. vertical intervals are constructed, thus giving bays which may vary in area from 4 to 5 acres up to 15 to 20 acres. As with border ditch irrigation this system of land preparation can be practised only where the land is very flat and the soil slightly impermeable.

Wild flooding is practised mainly on native pastures. Channels are constructed so that openings made give maximum cover of water. This system is wasteful of water and in Australia can lead to water-table troubles and salting problems.

Methods of Land Preparation

In Australia preparation of land for irrigation is generally carried out by the farmer. The machinery used is neither extensive nor costly. This is possible largely because a lot of the land prepared for irrigation is naturally flat and no great movement of earth is necessary to obtain a level grade.

The usual machinery is a buckboard, a land grader, a crowder, and a delver. The buckboard and land grader are used for levelling, the crowder for constructing the levees, and the delver for digging the head-races. The buckboard may also be used for forming the levees.

On one area being prepared for irrigation the land was first given one stroke with the buckboard and then two strokes with the land leveller (the latter was somewhat similar to the Eversman land leveller). The banks were then put up with a crowder from the flat and the land either side of the bank again levelled with a stroke of the land leveller. Finally, the head-races were constructed with a delver.

Head-races and Head-gates

Designs of head-races in Australia are many and varied. The most popular appeared to be a flat race with low banks. Most head-races are constructed shallow enough to allow a tractor to get into and out of a race without difficulty.

For irrigating border check land Australian irrigators use a very small head of water; half a cusec per check

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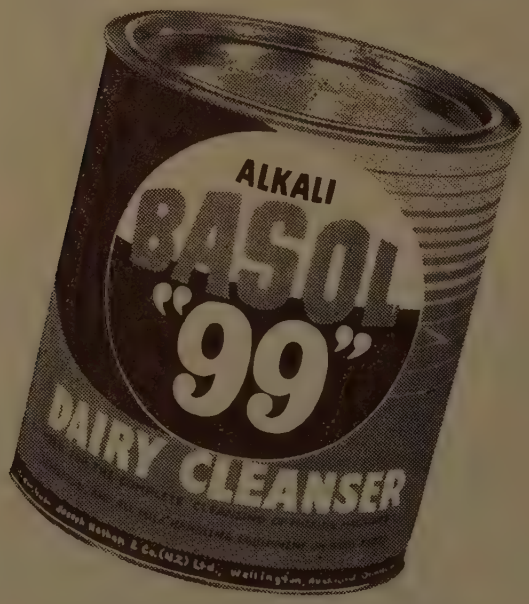

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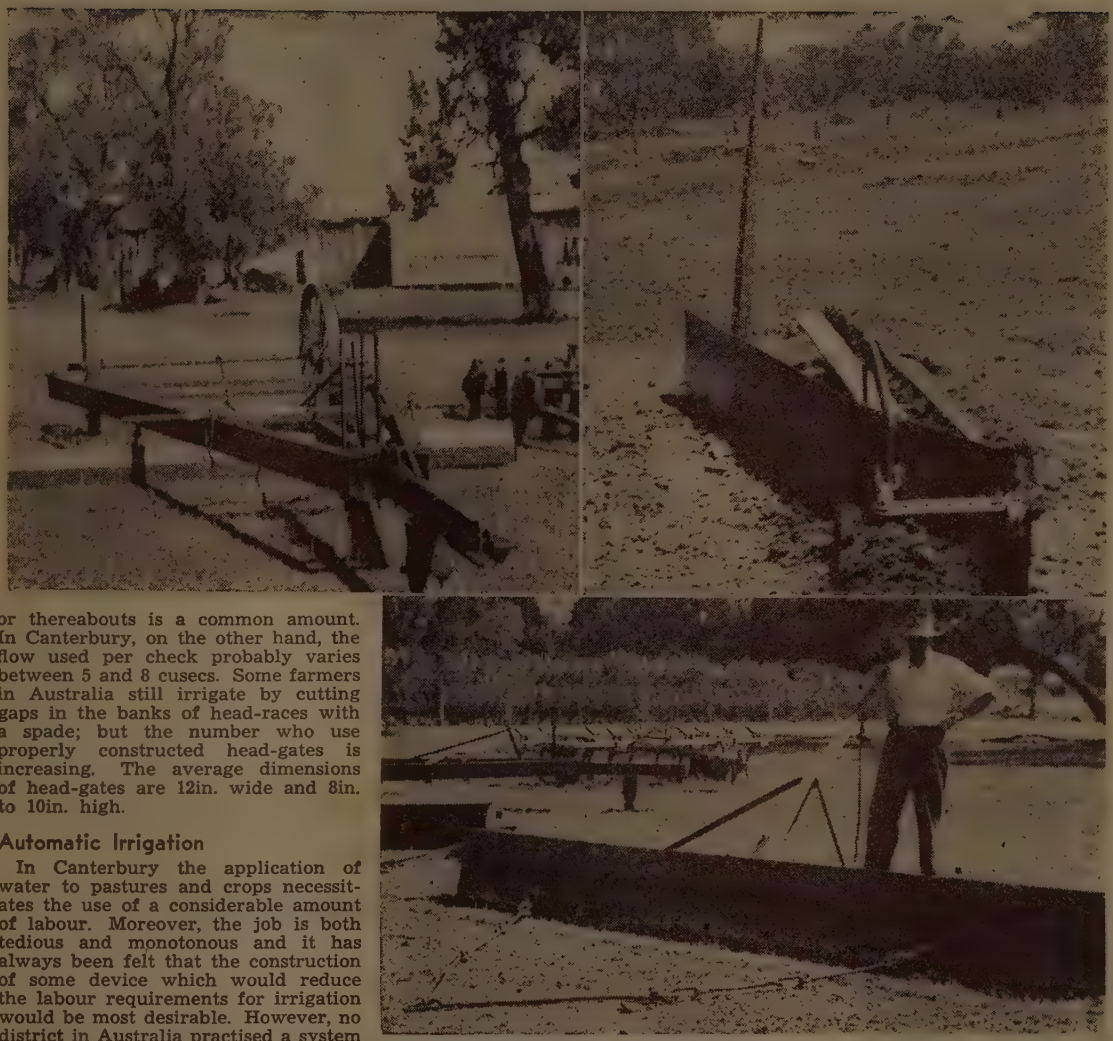

Most farmers prepare their own land for irrigation. Upper left—A typical land grader. Upper right—A delver, an implement used for the construction of head-races. Lower—A buckboard. This is used for levelling land and constructing levees.

or thereabouts is a common amount. In Canterbury, on the other hand, the flow used per check probably varies between 5 and 8 cusecs. Some farmers in Australia still irrigate by cutting gaps in the banks of head-races with a spade; but the number who use properly constructed head-gates is increasing. The average dimensions of head-gates are 12in. wide and 8in. to 10in. high.

Automatic Irrigation

In Canterbury the application of water to pastures and crops necessitates the use of a considerable amount of labour. Moreover, the job is both tedious and monotonous and it has always been felt that the construction of some device which would reduce the labour requirements for irrigation would be most desirable. However, no district in Australia practised a system of automatic irrigation. As mentioned above, the work involved in applying the water in Australia is reduced appreciably by splitting the flow in the head-race so that only a relatively small quantity of water goes down each border check.

Cleaning of Head-races

Water in head-races choked with grasses and weeds is sometimes lost, thus reducing the rate at which the land can be irrigated. As this applies to schemes in Canterbury, an investigation was made into methods of ditch cleaning in Australia.

Several methods are employed for the cleaning of ditches: (a) Offset discs. (b) Rotary hoe. (c) Various forms of blades or buckets. (d) Sheep. (e) Sprays.

In New South Wales the use of offset discs for the cleaning of growth from races is common. The discs chop up the growth, which is then removed mechanically with a delver or some other blade.

Victorian irrigators favour the use of the rotary hoe for ditch cleaning, and this machine was stated to be very effective where the ditches originally had been constructed for its use.

Various forms of blades or buckets operated mechanically were to be seen in use. These operated successfully in removing excessive growth and silt, provided the bottoms of the ditches were soft.

Any mechanical form of ditch cleaning—even though it may be effective—tends to deepen or alter the shape of the ditch, both of which may be undesirable. At the State Research Farm, Werribee (Victoria), some of the head-races are double fenced and are grazed at suitable intervals with relatively large mobs of sheep. This method has been found most effective for controlling excessive growth and the authorities consider that the cost of additional fencing is soon recouped from increased efficiency of irrigation.

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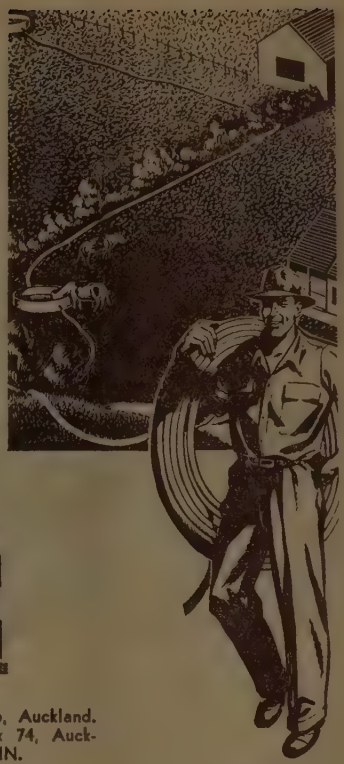

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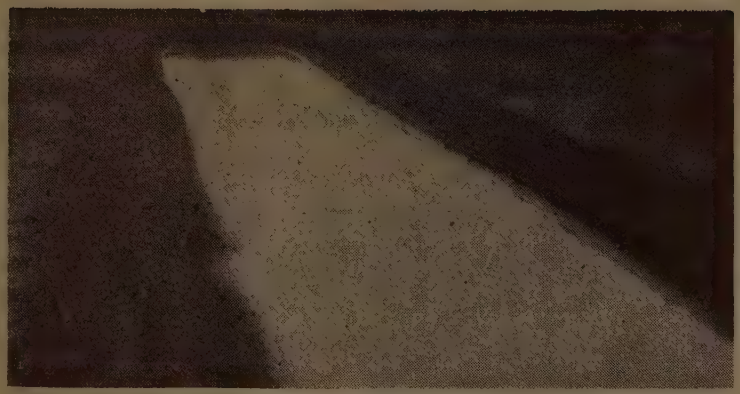

A flat type of head-race in the Finlay district, New South Wales.

The use of hormone sprays for the control of growth in ditches and canals is being investigated and research so far has indicated that certain weeds can be effectively and economically controlled by spraying.

Water Rights

Each centre of irrigation in Australia is known as an irrigation district and for each district the relative water commissions hold registers of land, giving details of acreages of each farm commanded by and suitable for irrigation. Based on the area of irrigable land, water is allocated to farmers on a pro rata basis. This allocation, which is known as a water right, varies from 1 acre foot of water per 5 acres of irrigable land (sheep grazing and cereal growing) to 3 acre feet per irrigable acre (orchards, vineyards, fruits, and vegetables).

Where the water right is 1 in 1 dairying is usually practised. Dairying also extends to districts with a 1 in 2 water right and to a less extent where the water right is 1 in 3. Districts with a 1 in 4 or a 1 in 5 water right concentrate mainly on fat lamb and wool production with the growing of cereals.

The owners or occupiers of land to which water rights are apportioned are liable for the payment of a compulsory annual irrigation charge for the supply of water for the irrigation of such land. In some pro rata water right areas additional water may be supplied under special conditions; this is known as a sales quota.

Pastures and Pasture Mixtures

As is to be expected the kind of pastures grown tends to vary from district to district. In some areas, for example, perennial ryegrass and cocksfoot are not recommended; in other districts these two species form the basis of the pasture mixture. Pastures under irrigation in Australia can be broadly classified under three main groups: (a) Winter pastures. (b) Summer pastures. (c) Native pastures.

Winter Pastures

The main winter pasture grown is a mixture of Wimmera ryegrass and subterranean clover. Though both these species are annuals, they produce by reseeding a permanent pasture.

A typical head-gate, Deniliquin, New South Wales.

For the establishment of a winter pasture a common seeding rate is 2lb. of Wimmera ryegrass and 2lb. of subterranean clover per acre. Strains of subterranean clover sown are Mt. Barker, Tallarook, Bacchus March, and Clare. Different districts tend to favour one or other of these strains. The other main winter pasture grown is *Phalaris tuberosa* in combination with subterranean clover. Again a light seeding rate per acre is usual; *Phalaris tuberosa* 2lb. and subterranean clover (mid-season and late strains) 2lb. per acre.

One of several natural lakes in the Boort district. Farmers pump water from these lakes to irrigate adjacent country.

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[*Australian Official*

An irrigated orchard with concrete-lined irrigation channel. Vineyards, orchards, and citrus groves contribute much of the wealth from the irrigation areas in Australia.

Summer Pastures

Summer pastures, depending on locality, may be either perennial ryegrass-white clover dominant or paspalum-white clover dominant. Both paspalum and perennial ryegrass are sometimes included in the same mixture, typical summer pasture mixtures being as follows:—

	Lb. per acre		Lb. per acre
Paspalum ..	6	Perennial ryegrass ..	14
White clover .	1	Cocksfoot ..	4
Subterranean clover ..	2	White clover .	2
Wimmera ryegrass ..	2	Total ..	20
Lucerne ..	2		
Total ..	13		

Native Pastures

Native pastures consist in the main of danthonia species, *Chloris truncata*, and the barley grasses.

Application of Water to Pastures

Application of water to pastures can be divided conveniently into three sections: (a) Irrigation of summer pastures. (b) Irrigation of winter pastures. (c) Irrigation of native pastures.

Summer pastures (the true perennial pastures) are usually irrigated at intervals of approximately a fortnight throughout the irrigation season. Some 2in. to 3in. of water is applied at each irrigation and the total application of water for a season generally varies between 24 and 30 acre inches.

Winter pastures (Wimmera ryegrass and subterranean clover mainly) are irrigated at less frequent intervals than summer pastures. They may receive up to 5 irrigations in the season, some in the spring and some in autumn. The total amount of water used is approximately half of that applied to summer pastures.

Depending on weather conditions, the Wimmera ryegrass-subterranean clover pastures receive one or two irrigations between mid-March and the end of April and a further two irrigations or so in late August and September. Irrigation before mid-March or later than early October is not recommended, as temperatures are then sufficiently high to cause scorching of clover growth. It was stated that phalaris-subterranean clover pastures could be irrigated at about 10 per cent. higher temperatures than Wimmera ryegrass - subterranean clover pastures without ill effects to clover growth.

The irrigation of native pastures tended to be inefficient owing to lack of grading. Where these pastures were irrigated it was usual to apply up to 1 acre foot of water in two applications.

In the 1953-54 season in Victoria the area irrigated of each of the three classes of pastures mentioned was as follows:—

	Acres
Summer pastures	209,117
Winter pastures	313,890
Native pastures	89,414
Total	612,421

[Australian Official

Burrinjuck dam on the Murrumbidgee River, New South Wales. Water from Burrinjuck irrigates orchards, vines, rice fields, and other crops in the flourishing Murrumbidgee irrigation area.

Farming Systems under Irrigation

Irrigation farming in Australia is not confined to the production of livestock products. Horticulture products such as dried vine fruits, canning fruits, and citrus fruits contribute a very substantial amount of the total returns from irrigated land. For example, in Victoria, in the 1952-53 season the estimated gross value of primary production from irrigation districts was £34,720,000. Of this total, livestock products contributed £19,620,000 and horticulture products and vegetables £15,100,000. An interesting feature of livestock products was that dairy cows returned £9,100,000, almost half the total amount.

A somewhat similar position applies in the Murrumbidgee irrigation area. From an estimated total gross production of £7,763,350 in the 1951-52 season horticulture and vegetable products contributed a total of £3,484,950.

Dairying

Dairying is a major industry throughout the irrigation areas of both Victoria and New South Wales. Generally, dairying is confined to the better land with a 1 in 1 or a 1 in 2 water right and perhaps a sales quota in addition. Farm areas in the main vary from 50 acres to 150 acres. Summer pastures, for example, a mixture of perennial ryegrass, cocksfoot, and white clover or a mixture of paspalum, white clover, and lucerne, tend to predominate on the smaller dairy farms. On the larger dairy farms growth is usually provided by a combination of both summer and winter pastures. An appreciable amount of dairying is also carried out on sheep and cropping farms, a portion of the farm being set aside and provided with a sufficient area of summer pastures.

Hay, and to a less extent silage, are the main supplementary feeds produced on dairy farms. Pastures and lucerne are the main sources of both hay and silage, but in suitable localities Berseem clover, Japanese millet, and sweet sorghum are grown for hay in addition to grazing.

Brassica crops such as turnips, swedes, or chou moellier are not grown for wintering dairy herds.

Fat Lamb Production

Sheep farming is mainly carried out where the water right is insufficient (from 1 in 3 to 1 in 5) to maintain summer pastures. A small area of summer pastures may be grown, but the bulk of the water supplied to sheep farms is used for the production of winter pastures of Wimmera ryegrass and subterranean clover. The reason for doing this is that good growth is obtained from these winter pastures with the use of approximately half the amount of water required for growth of summer pastures. Winter pastures are irrigated once or twice in autumn and produce growth throughout late autumn, winter, and early spring, stock management being arranged to fit in with this period of growth.

Lambing therefore takes place in autumn (late March and April). Throughout winter and early spring the ewes and lambs are grazed on the Wimmera ryegrass-subterranean clover pastures. The first draft of lambs is ready for marketing in July and further drafts are sold throughout August and September.

The Merino-Border Leicester cross ewe is very popular for the breeding of fat lambs, and perhaps the most popular fat lamb sire is the Dorset Horn.

The winter pastures are again irrigated once or twice in spring and the resultant growth is sufficient to carry the ewe flock through until the following autumn. Owing to the hot, dry conditions which prevail during summer, the subterranean clover growth is parched and dry, but the ewe flock seems to do well on it.

Some farmers grow some phalaris and subterranean clover. This combination produces growth earlier in autumn than Wimmera ryegrass-subterranean clover and is therefore very useful in the early part of lambing.

Spring tupping does not give as high a lambing percentage as autumn tupping. Lambing is 80 per cent. or thereabouts. Ewes and lambs are usually rotationally grazed.

Conclusion

Irrigation in Australia over the last 50 years has had its difficulties and there are still many problems. To the agriculturist salting is perhaps the major one. Nevertheless irrigation has been responsible for a tremendous increase in production. It has enabled the dairy industry and the fat lamb and wool industry to expand enormously. It has provided the necessary conditions for the establishment of orchards and vineyards and it has made possible the growing of rice, vegetables, and other primary products; finally irrigation has been responsible for the growth and development of several progressive towns in both New South Wales and Victoria.

The area irrigated continues to expand, the authorities responsible pushing ahead with new schemes as opportunity permits. Two major works proceeding at present are the big Eilden dam and the Snowy River schemes.

Combating Army Worm with Chemicals

DURING the summer and autumn of the 1954-55 cropping season there were reports throughout New Zealand of extensive damage by army worm. This insect is usually identified in New Zealand as *Persectania composita* Guen. (*P. ewingi* Westwd.). Measures for control of the pest are discussed in this article by A. D. Lowe, Entomological Research Station, Department of Scientific and Industrial Research, Ashburton.

FOR several years caterpillars of this species have been known to cause damage, especially to cereals, in various parts of the country. When fully developed they may be 1¼in. to 1½in. long. They are khaki to brownish with several darker stripes running lengthwise along the body. They are known as army worms because of a peculiar habit they have of moving like an army, almost in formation, from one area to another. After pupation they emerge as one of the larger brownish moths commonly attracted to lights on warm summer and autumn evenings.

Many of the older reports of damage are confined to cereals. In such crops the caterpillars climb the stems which are almost ready to cut and chew through them above the flags, allowing the heads, usually undamaged, to fall to the ground. This type of damage is common in barley, to which the insect seems particularly attracted. Wheat and oats are also frequently affected, damage to such crops being considerable. In infested paddocks counts of damaged stems show that up to 25 per cent. of heads are on the ground, even in a moderate infestation.

Recent reports of damage by this insect, which is known to be a universal feeder, have shown that it has a marked interest in grass seed crops. Damaged fields inspected have included different types of ryegrass, and in one case there was severe damage to timothy being saved for seed. In all these crops the caterpillars were eating the maturing seed while it was still green. A paddock of severely infested ryegrass under observation eventually reached a stage where harvesting was not worth while. Besides eating the seeds in the heads, the insects cause the flags of the close-growing plants to assume a tangled appearance. With timothy the damage consisted of removing a fairly large part (frequently up to 50 per cent.) of the seed from the shady side of the stem.

The army worm also frequents the aerial parts of tussock grasses, in which it is held responsible for considerable damage, though the part it really plays in this has not yet been determined.

It is reasonable to assume that infestations of this insect build up for some time in the paddock before beginning to inflict damage. Measures to prevent such a build-up must be sought on a long-term basis in relation to management, and it is probable that this will prove critical in the early stages of the crop concerned.

Under some circumstances the caterpillars desert the crop and move away. What factors are responsible for "triggering" this activity are not known, and experience has shown that in 90 per cent. of crops the phenomenon, if it occurs, does so only after major damage has been done. A natural factor giving some control in the field is a virus disease which attacks the caterpillars. Knowledge concerning it is very sparse, though it is known to have been responsible in some isolated cases for the death of over 90 per cent. of the caterpillars. However, the disease cannot be relied on as a source of control and the only realistic approach once damage is noticed is to treat crops promptly with chemicals.

Sprays and Dusts

Though no strictly scientific work has been done by the Entomological Research Station on the problem, certain recommendations for control have been made to farmers both by the Station and by firms retailing insecticides. Growers have reported considerable success in gaining control.

Warning

THE materials recommended in this article are highly toxic to honey bees and other beneficial pollinating insects. Though the treatment of non-flowering crops (pastures) as recommended in the article is not likely to have any serious harmful effect on these insects, operators must nevertheless exercise the utmost care to prevent spray (dust) drift on to neighbouring crops or pastures, particularly those in the flowering stage, or on to hives of honey bees in the vicinity of the area being treated. Before control measures on the lines indicated are undertaken the local instructor of the Extension Division of the Department of Agriculture should be consulted.

No portion of this article may be reproduced unless it is accompanied by the warning in the preceding paragraph.

A limited number of treatments have been inspected by the writer and the results have certainly been satisfactory. All treatments have been by aerial application. Both sprays and dusts have been used with satisfactory results, the materials being as follows:—

Sprays: DDT emulsion (20 per cent. p.p.i.) at 1 quart per acre (¼lb. p.p.i. DDT) applied in 2 to 3 gallons of water. This preparation is readily available and cost of material is about 11s. per acre.

Dusts: DDT dusts of approximately 12½ per cent. p.p.i. concentration have been used at 8lb. per acre. As dusts of this strength are not readily available, it has been necessary to use 2lb. of 50 per cent. p.p.i. DDT mixed with 6lb. of filler per acre. Superphosphate or finely ground lime has usually been used as the filler and total cost of materials is about 12s. 6d. per acre. A suitable commercially prepared DDT dust will probably be available in future. With dusting 1lb. p.p.i. DDT per acre is used, whereas the spray uses only ¼lb. p.p.i. DDT per acre. Both treatments have given satisfactory control.

Crops Undersown with Pasture

Where cereal crops have been undersown with grass and army worm gives trouble in the cereal considerable eating of the crowns of the young grass plants is also likely to have occurred. The caterpillars spend much time sheltering at ground level, and during such periods use the young grass plants as food.

Some farmers have found that a satisfactory method of treatment is to use 2lb. p.p.i. DDT (as recommended by Kelsey (1) for control of grass-grub) and to apply this from the air mixed with sufficient filler to suit the aeroplane's sowing rate per acre. Most of the insecticide eventually reaches the ground, where it will give protection against grass-grub in the pasture. Those using this method of making one application do two jobs should always take the practical precaution of sampling with a spade in subsequent seasons to ensure that grass-grub has been controlled.

Whatever method is used, costs given above refer to materials only. To this should be added the cost of flying time, which has varied between 7s. and 17s. per acre according to size of paddock and distance from the airfield. Some economy is possible where several farmers agree to treat adjacent areas at the one time.

Some commercial firms have used the insecticide lindane for control of army worm, but DDT has been found to give a quicker knockdown. The caterpillars climbed the stalks again after treatment with lindane, though no evidence of further feeding was seen. With DDT there was not the slightest doubt that immediate and effective control was obtained.

Residues

The Entomological Research Station feels that with dusting there is a better chance of escaping the effects of harmful residues than with spraying. Emulsions, the liquid preparations used almost exclusively in aerial spraying, are specially designed to adhere to foliage and are particularly effective in this respect. There is a reasonable chance that where dusts are used any undesirable residues will be disposed of during harvesting.

The presence of insecticidal residues in cereals intended for human consumption is a point about which growers should be careful. This point also has a bearing on the use of DDT in preference to lindane. The latter has been shown to have an adverse effect on seed wheat (2), and to have some effect on the germination and early growth of other cereals and some grass seeds (3). Overseas, malting barley is not acceptable to brewers when contaminated with this insecticide.

On all counts, therefore, DDT is the more desirable insecticide for this type of work.

References

(1) J. M. Kelsey, "The New Zealand Journal of Agriculture", vol. 83, pp. 113-122 and 195-200, "Grass-grub and Grass Caterpillar Control" (1951).

(2) A. D. Lowe, "The New Zealand Journal of Agriculture", vol. 86, pp. 305-306, "BHC and Lindane are Dangerous to Wheat" (1953).

(3) A. D. Lowe, "New Zealand Science Review", vol. 11, pp. 101-102, "An Examination of Some Phytotoxic Effects of Insecticides Recommended for the Control of Grass-grub in New Zealand" (1953).

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during May as follows:—

1XH Hamilton, 12.33 p.m.

14 May—"Culling the Dairy Herd", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

21 May—"Control of Soil Moisture", by H. G. Hopewell, Soil Research Station, Hamilton.

28 May—"The Farmer Speaks", by M. Boyce, Federated Farmers, Hamilton.

1YZ Rotorua, 7.15 p.m.

10 May—Young Farmers' Clubs' talk.

23 May—"Care of Sow and Litter during Winter", by H. H. Preston, Supervisor, Bay of Plenty District Pig Council, Whakatane.

24 May—"Causes of Low-quality Milk and Cream", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

3YA Christchurch, 12.20 p.m.

7 May—"Winter Feeding Town Supply Dairy Herds", by A. G. Brash, Veterinarian, Department of Agriculture, Christchurch.

21 May—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin, 12.30 p.m.

1 May—"Poultry Disease", by J. Jones, Poultry Instructor, Department of Agriculture, Oamaru.

8 May—"Fertiliser for Pastures", by N. A. Cullen, Research Officer, Invermay Research Station, Mosgiel.

15 May—"Plant Moisture Requirements", by W. G .Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

22 May—"Farm Surveys", by A. H. Mouat, Farm Economist, Department of Agriculture, Dunedin.

29 May—"Beef Production", by I. M. Cairney, Veterinarian, Dunedin, and K. H. C. Lewis, Invermay Research Station, Mosgiel.

4YZ Invercargill, 7 p.m.

1 May—"Extension Visits in Eastern Southland", by T. L. Reid, Fields Instructor, Department of Agriculture, Gore. "Grow your own Christmas Tree", by F. E. Wilkin, Plant Quarantine Officer, Department of Agriculture, Invercargill.

8 May—"Extension Visits in Eastern Southland", by T. L. Reid, Fields Instructor, Department of Agriculture, Gore. "Ornamental Shrubs", by F. E. Wilkin, Plant Quarantine Officer, Department of Agriculture, Invercargill.

15 May—"Utilisation of Supplementary Feed", by R. Rankin, Fields Instructor, Department of Agriculture, Invercargill. "Extension Visits in Eastern Southland", by T. L. Reid, Fields Instructor, Department of Agriculture, Gore.

22 and 29 May—"Utilisation of Supplementary Feed", by R. Rankin, Fields Instructor, Department of Agriculture, Invercargill. "Danish Farming", by C. D. Denize, Instructor in Agriculture, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays, Tuesdays, Wednesdays, Thursdays, Fridays, 7.45 p.m., and Saturdays at 6 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.36 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

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2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Grazing Management of Autumn-sown Pastures

SHEEP farmers are not often at fault in the grazing management of autumn-sown pastures. With big mobs of sheep they can feed back the top growth of the ryegrasses quickly and give the slower-establishing clovers and grasses a chance to get plenty of light, which is essential to their growth. The small feet of the sheep serve to consolidate the ground further in favour of the clovers without damaging the sward by pugging or otherwise cutting it about in wet conditions.

A good deal of damage is often done to young pastures on sheep farms, however, by grazing them too long and too hard before the clovers have become properly established. In the early stages it is best to put in big mobs of sheep and give the pasture regular spells between grazings.

On the dairy farm the position is a little more difficult, especially in wet autumns or where the drainage is not very good. Whatever the conditions, it is as well to realise that the clovers, so essential to the proper growth of the grasses in spring, cannot establish and hold their own under long top growth of grasses, nor can the slower-growing grasses get going. The top growth must be kept down and if this cannot be done because of wet conditions and the possibility of severe damage to the soil by the stock, the mower should be used; if the surplus grass is heavy, it should be removed.

As on the sheep farm, the general practice for the first 2 or 3 months should be to graze off the top growth from 3in. to 4in. down to about 2in. as quickly as possible and then give the pasture a spell for the next growth.

If the pasture gets cut about by the stock, a run over with a weighted roller will do much to remedy the damage. Smothering of the young seedlings of the slower-growing grasses and clovers must be prevented.

—*C. J. HAMBLYN,*
Fields Superintendent,
Department of Agriculture,
Palmerston North

Control of Sand Breaks

By A. A. DUNCAN,
Instructor in Agriculture, Department of Agriculture, Wanganui

SAND breaks are a familiar sight on all sand country except in the low-lying areas where the water-table is high for most of the year. They occur most frequently on the sunny slopes of the dunes, particularly on aspects that get the full force of the prevailing westerly wind in spring and summer. The composition of the pasture on the sunny faces of sand ridges is strikingly different from that of the shady faces. In a dry summer many of the sunny faces have at least 50 per cent. of bare ground, with New Zealand rice grass *(Microlaena stipoides)* and ratstail *(Sporobolus capensis)* the only prominent pasture species. The shady faces on the other hand frequently have a productive pasture of ryegrass, cocksfoot, and white clover, with almost no bare ground. It is therefore not surprising that practically all sand breaks occur on sunny faces. Bare ground left after the annual clovers and grasses die out in the early part of a dry summer is the most vulnerable spot for a sand blow to start. Sand breaks have one thing in common and that is they are difficult to heal and there is no short-cut method of effectively dealing with them. The following is a description of the methods used to combat sand blows on Mr. N. W. Parsons's sand country property at Waitotara.

ONE of the earliest methods of dealing with sand breaks was to cover them with branches of boxthorn in the days when hedges were cut with slash hooks. The branches were tied down to pegs with thin wire and grass seed was scattered over the area when the leaves had died off the boxthorn. Now that hedge cutting machines are used hedges are cut more often and the material is not really suitable for use in sand breaks. The use of boxthorn is quite effective, but rather untidy because bits of branches eventually become scattered over the paddock.

Dealing with Large Breaks

The present method of dealing with large sand breaks is to fence them off entirely from stock and allow them to regenerate. The vertical ledge of the perimeter of the break is levelled with a spade to the approximate contour of the sand ridge. The levelling is done in autumn and is necessary because grass will not establish on a vertical drop and if the ledge were left, it would be a focal point for starting off another break. The area is seeded in April with a mixture of perennial ryegrass, white clover, crested dogstail, *Danthonia pilosa*, and cocksfoot.

Stock are excluded from the area for at least 12 months to give the grasses and clovers time to reseed and thicken up the turf. After this period a corner of the fence may be taken down and stock permitted on the area for a short period. For a start grazing is confined to winter, but as time goes on and the break heals the area is opened to stock all the time. However, the fence is not taken down for at least 3 years in case the break shows signs of reopening.

Dealing with Smaller Breaks

A method of dealing with smaller breaks is to give them a preliminary levelling and then cover them over with clay loam or similar heavy topsoil. This method is limited to those farms where such filling is reasonably handy and would not be applicable on many sand country farms. In some locations the material excavated when V drains are being formed is quite heavy and suitable for filling. The excavated material has, in any case, to be taken away from the shoulders of the drain to allow free entry of surface water and it is little extra trouble to cart it to the sand breaks. There is a certain amount of grass seed in the spoil from the drains and this establishes quickly. Extra grass seed is sown on the filling in the following autumn.

A further method of dealing with the breaks is to returf them in winter with turf taken from the heavier, low-lying country. The turf is ploughed out and then cut into lengths convenient for handling. This method generally is successful, but has been known to fail, particularly when the following summer is drier than usual. At this stage the depth of the rooting system is not sufficient to withstand long periods without rain.

Tree Planting of Steep Ridges

Steep sand ridges that lie into the sun and the prevailing wind are put into trees and fenced off. No attempt is made to farm them, because the limited amount of stock carried would not compensate for the trouble of keeping the pasture intact. *Pinus radiata* is used in preference to *Cupressus macrocarpa*, because it is quicker growing and better able to withstand the wind and dry conditions. A further advantage of *Pinus radiata* is that there are very few deaths of the young trees in the first year. The most successful results have been obtained by planting 2-year-old trees.

▼ A typical sand break.

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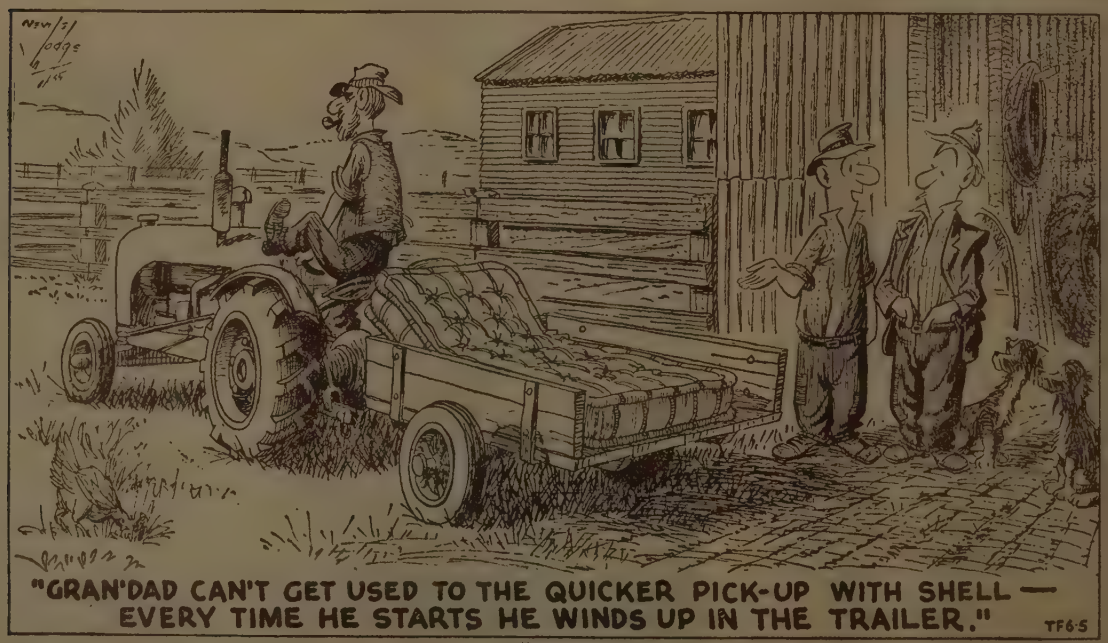

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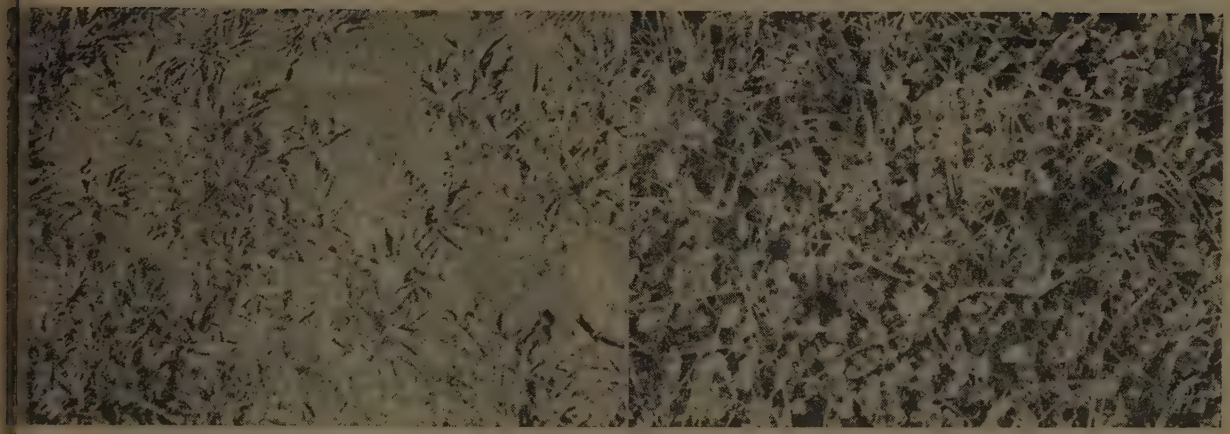
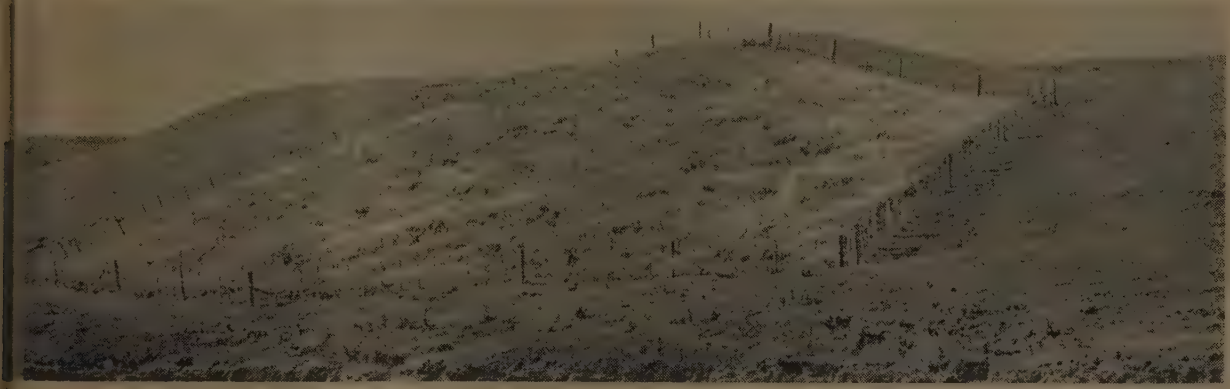
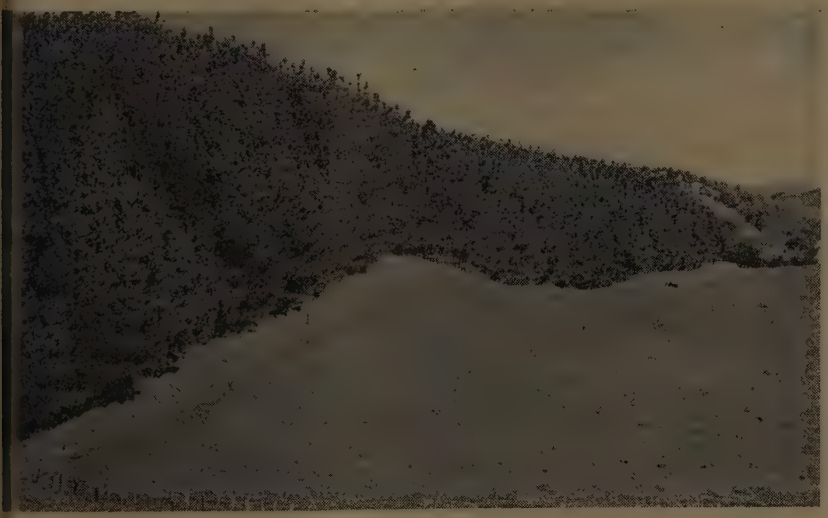


Left—Sand breaks are most likely to start on thin pasture on sunny faces. Right—Pasture on shady faces is markedly superior to that of sunny faces. This photograph was taken only 18yds. away from that at left on a similar slope.





▲ Big breaks are fenced off from stock, oversown, and allowed to regenerate.

← *Pinus radiata* is planted on the very steep slopes facing into the westerly wind.

General methods to prevent rather than cure sand breaks lie in avoiding overstocking, particularly in summer. Aerial application of superphosphate was begun 3 years ago on sand ridges which were not readily accessible with ground implements and this has resulted in a noticeable decrease in the number of sand breaks.

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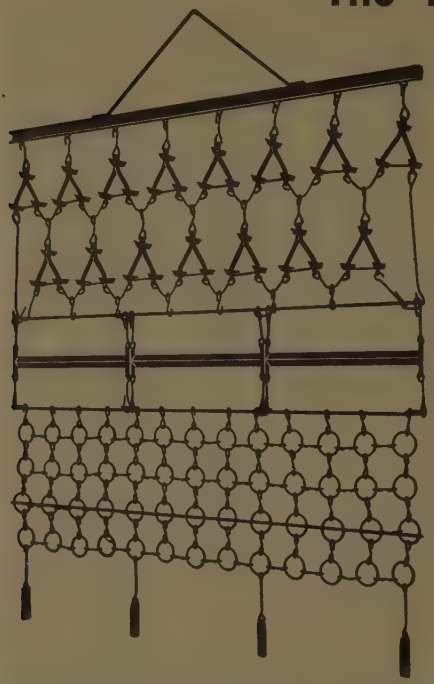

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More Tree Nuts Should be Grown

EACH year large quantities of nuts of all types are imported into New Zealand to meet consumer and factory demands, and though nuts could play an important part in the diet, they have become a luxury almost beyond the reach of people of average incomes. Some nuts are grown in the Dominion, but only a very small part of total requirements. Surely efforts can be made in this country, much of which is so adequate in soil and climate for the purpose, to be more self-sufficient in nuts. In the hope that more interest will be shown in nut production T. Conway, Horticultural Instructor, Department of Agriculture, Hastings, in this article describes the culture of several types of nuts that may be grown in New Zealand.

FEW plantings of nuts in New Zealand at present are conducted on good commercial lines. Walnuts are generally planted as odd trees in domestic or farm gardens or as boundary shelter belts on farms. Sometimes waste land also is planted in walnut trees, but often the conditions are far from ideal for good results. Almonds and hazels are usually planted as individual trees or as short hedges in domestic gardens, with little specialised attention being given them.

There is obviously ample scope for extensions of plantings on a commercial or semi-commercial basis, and a good market is assured for any nuts produced. There are probably many places where the well-known standard types of nuts could be grown. Any attempts along these lines must, however, be considered a long-range project, possibly with the exception of almonds, which crop earlier than other species.

Walnuts usually grow into large trees and are better suited to farm lands, where space is not so limited, but almonds and hazel nuts can well be planted on smaller areas, perhaps in the form of hedges, or in or near home gardens. Such plantings if given reasonable attention can often be a profitable side line. There are also possibilities in using tree nuts as driveway avenues or for areas bordering roads or plantations.

A large proportion of the world's almond and hazel production comes from the Mediterranean countries, the industry being a prominent one in Spain, but considerable development has occurred in California, South Africa, and parts of Australia, especially South Australia and New South Wales, where almonds are now fairly widely grown. Walnuts are grown extensively in France, Italy, Rumania, California, and China.

Reference to tree nuts in this article is limited to three types (walnuts, almonds, and hazels) which are considered most worthy of more attention. Macadamias, pecans, and cashews are

HEADING PHOTOGRAPH: A block of walnut trees 30 years old sown down in grass for grazing. National Publicity Studios photo.

elsewhere, but insufficient to yet assess of their merit under New Zealand conditions.

WALNUTS

Soil and Climate

Walnut (*Juglans regia*) roots to a depth of about 3ft. and must be planted in reasonably deep soil of good depth and not, as they often are in poor waste land. Often, too, the land on which they are planted is not properly drained, and this either prevents their development or ultimately causes dying back or death of the trees. For satisfactory results the land must be well drained.

Climatic requirements may limit the production of walnuts in some districts in New Zealand, as is shown up by the fact that in the main they do better in places like Hawke's Bay, Blenheim, some parts of Otago, and Auckland. Juvenile growth needs to be about May to Nov., and though reasonably high summer temperatures are to be welcomed very high temperatures or high humidity are limiting factors.

Late spring frosts can be damaging during the blossoming and setting periods and may result in inferior crops. There are many areas in New Zealand, however, which provide the soil and climatic requirements and make an attempt to grow walnuts worth while.

Tree Propagation

It is perhaps unfortunate that most walnut trees at present growing in New Zealand are seedlings and thus do not conform to specific varietal characteristics. Production and quality of nuts from these seedling trees, propagated by sowing nuts from any convenient tree, can be extremely variable, many having inferior nuts or very light crops. This has discouraged those attempting to grow walnuts and thus tended to retard progress in extending production.

The advantages of grafted or budded trees of proved varieties cannot be overstressed and all new plantings should consist of such trees, the good quality and cropping ability of which are assured. Grafted or budded trees produce nuts much earlier after planting than do seedling trees.

Juglans regia, the Northern Californian black walnut is usually recommended as a stock. *J. californica* is used to a less extent as it is more subject to disease. Seedlings of the ordinary Persian or English walnut, *J. regia*, appear to be used quite commonly as stocks, having advantages in better compatibility and being quite suited for some conditions such as light soils. It is presently the only variety locally available as a stock in New Zealand.

The Eastern black walnut *J. nigra* has sometimes been used as a stock, but has not proved as popular as those mentioned. Unfortunately grafted or budded trees are not at present easily available in New Zealand, as their propagation requires a special technique by nurserymen and a high percentage of "takes" is seldom achieved.

This line appears to be one in which a few nurserymen could well specialise as there is a fairly wide demand for worked walnut trees.

Furthermore progress in walnut production can be envisaged if trees of proved varieties were freely available.

Some varieties are more susceptible than others to the bacterial blight (*Xanthomonas juglandis*), and it is possible by growing worked trees to select varieties which are least affected by this disease. Varieties also vary in their self-fertility and it is always advisable to plant different varieties in proximity to assist in pollination, with consequent increased cropping.

Varieties

Varieties which can be recommended are Eureka, Franquette, Concord, Wilson's Wonder, Prestiford, Dem, Payne, Placentia, and Mayette. Wilson's Wonder has proved of high merit.

Soil Preparation and Planting

The soil should be given thorough preparation before planting, particularly round the area pegged for each tree. Cultivation at this spot requires to be deep, with the subsoil turned over at the bottom of each hole which should be at least 3ft. in diameter and deep enough to take the taproot of the tree comfortably.

Any damaged parts of the roots should be trimmed off before planting and trees planted to the same depth that they were in the nursery. This is usually shown by a soil mark on the lower part of the main stem. Topsoil should be used to fill in the hole and this should be trampled firmly as filling progresses.

Trees should be planted 45ft. to 50ft. apart each way, though 60ft. would be better with some varieties on really good land. This would give 17 trees per acre at 50ft. spacings and 12 trees at 60ft. Some temporary interplanting can be done if desired, provided such plantings are removed before any ill effects occur to the permanent walnut trees.

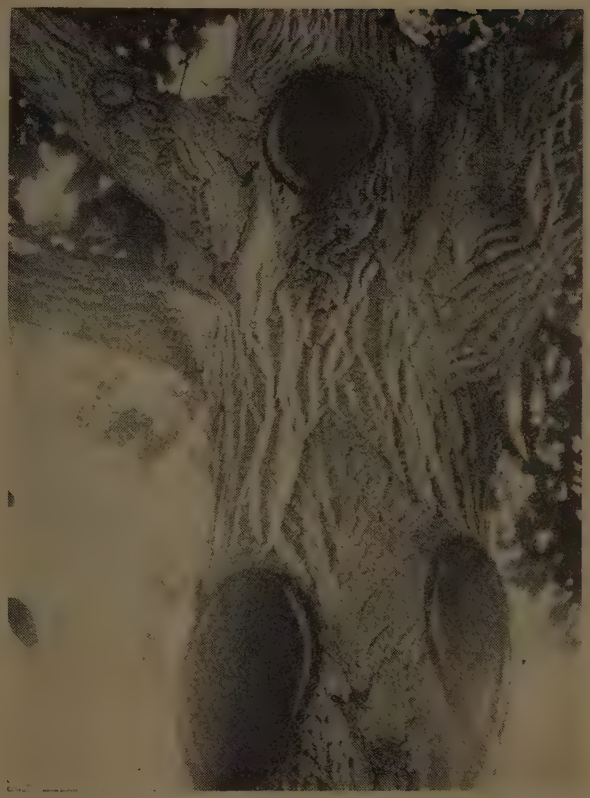
Cultural Aspects

If the young trees are just rods they should be cut back to about 5ft. to force branched heads well clear of the ground. All later-developing branches lower than this should be removed and only light shortening or thinning given to assure good tree shape and balance. Cutting of heavy limbs at a later stage should be avoided, but if it becomes necessary it should be done during late May or early June and the cuts thoroughly sealed with a bituminous tree-sealing material. Severe bleeding is apt to occur if limbs are cut when the trees are growing.

In the early stages of development periodic cultivation should be given 4ft. to 5ft. out from the trunks of the trees and an occasional application of mixed fertiliser is beneficial. The area between the trees can be inter-

▼ Part of a walnut tree bearing a heavy crop of nuts.

Blossom development stage of walnut at which first bordeaux spray must be applied for best control of bacterial disease.



Trunk of walnut tree showing excellent callus formation of large cuts after removal of branches. Branches were removed in late May and the photograph was taken the following March. No bleeding occurred.

cropped and later grassed down for grazing, preferably with sheep.

Harvesting

Harvesting is facilitated by the fact that the nuts drop to the ground when mature. The nuts generally break cleanly away from the outer green coating (the hull) as they fall, but some will retain their hulls. These can be picked up separately and may require further drying or treatment to free them from the hulls. If they do not respond in reasonable time, they may not be worth further trouble, as many are likely to be faulty internally.

Close grazing or mowing before the nuts fall will assist harvesting and avoid waste. Harvesting should be progressive so that the nuts do not become discoloured or dirty. If washing is necessary to assure bright, clean nuts, facilities must be provided for quick drying in the sun after washing.

Disease Control

Walnuts are subject to a bacterial disease (*Xanthomonas juglandis*) which, if not controlled, can cause severe loss of nuts. This disease affects the young shoots, flowers, nuts, and leaves, the most troublesome infection being on the young nuts, and this becomes progressively worse as the nuts mature.

Activity of the bacteria occurs just before the flowers appear and control measures must be taken at this stage. Bordeaux mixture has been found the most effective spray and a strength of 5 : 4 : 50 can be recommended for the first spray, which should be followed about 2 weeks later by an application at a strength of 3 : 4 : 50. Thorough spray coverage is essential and for large trees a high-powered orchard sprayer is very suitable. This disease must be controlled to assure economic production of walnuts.

ALMONDS

Soil and Climate

In view of the fact that almonds (*Prunus communis* Fritsch) can be grown almost anywhere peach trees succeed it is rather surprising that so few attempts are made to grow them. Generally, peaches thrive well over a wide area of New Zealand, and there is ample opportunity greatly to extend the production of almonds, especially in the leading peach areas. This applies both to domestic gardens and commercial areas. It is a crop which could easily be associated with commercial orchards, as it would fit into the peach programme for treatment.

Areas relatively free of late frosts are preferable, as the almond flowers earlier than other fruit trees and is subject to damage from frosts. Some coastal areas may be well suited to their culture, as such localities are often almost frost free. High humidity, however, is a disadvantage.

Soils should be light to medium silt loams of ample depth with free-draining subsoils of silt or sand. Heavy clay subsoils are unsuitable and low-lying areas should be avoided. As the almond is deep rooting, well-drained alluvial soils are best.

If natural soil drainage is not good, provision must be made for tile or

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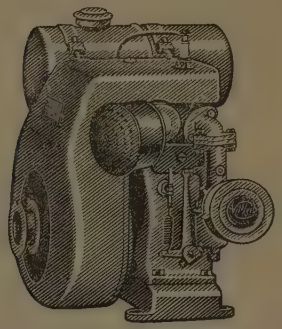

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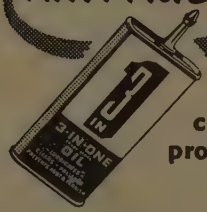

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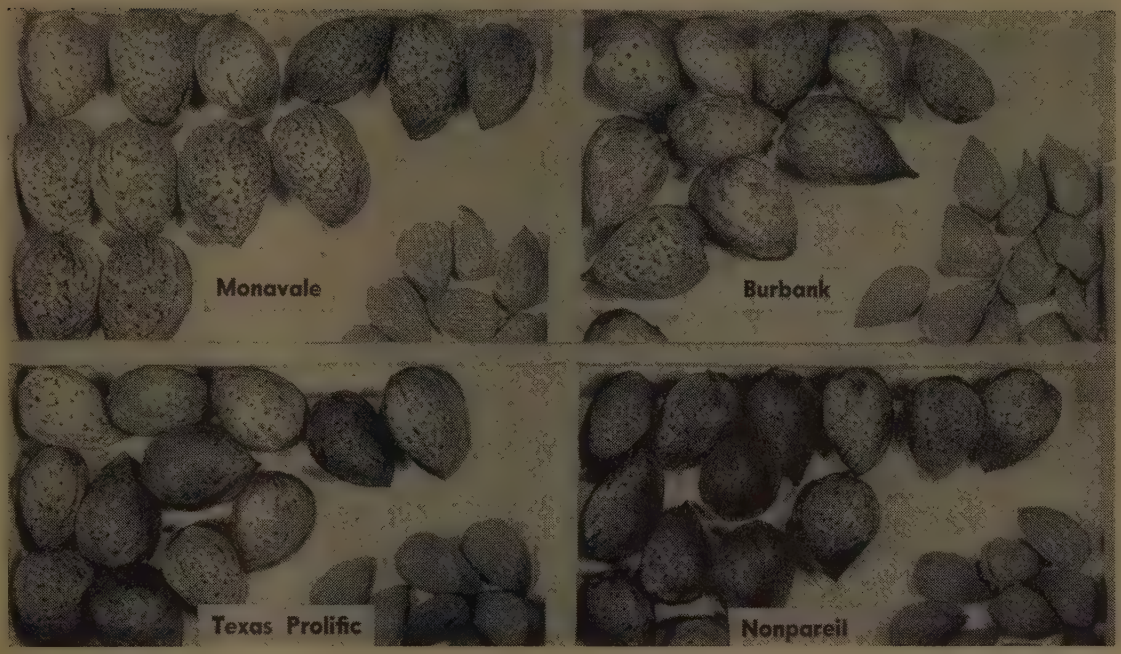

[*R. W. Orr*

Four varieties of almonds of good quality grown at Bay View on the east coast a few miles north of Napier.

open drains. A rainfall of 25in. per annum or more is needed and irrigation facilities are an advantage.

The site should be exposed to full sun, and shelter is necessary against prevailing winds.

Varieties and Stocks

Provided the site and locality are satisfactory, successful production of almonds is closely related to the selection of the most suitable varieties and stocks on which the trees are propagated. Little investigation appears to have been done in New Zealand on varieties and stocks, but much has been carried out overseas.

Almond and peach seedling stocks have been used mainly, but almond stock is generally preferred. It stands up to dry weather better and produces a bigger and longer-lived tree and better nuts.

As all almonds are self-sterile, provision must be made for cross-pollination. This can be assured by the planting of a number of varieties in close association, particularly those which flower about the same time. The placement of strong hives of bees near the trees greatly assists pollination.

There are two main types of almonds, the sweet, used for dessert and in confectionery and cakes, and the bitter, used for the production of almond oil and essences. The sweet varieties are further sub-divided into thin or paper shelled, soft shelled, and thick or hard shelled. The paper shelled are more suitable for dessert, but do not withstand handling and transport as well as hard-shelled varieties. The following varieties are recommended as worthy of trial:—

Early Flowering

Chellaston: This variety is a consistent and heavy cropper of good-quality nuts which are plump and sweet. Some of the nuts tend to hold their fleshy coating (or hulls) in dry seasons, but this is not a serious disadvantage. The shell is medium to soft. The trees are relatively small, but this has its advantages in ease of handling.

Brandis Jordan (syn. Brandis): The nuts are of good appearance in the shell, and though the kernels are not as attractive as some others, they are sweet and of good flavour. The tree is characterised by upright growth and is a pollinator for Chellaston. It is a soft-shell type.

Early Jordan: This variety also appears to be a suitable pollinator for Chellaston. It is an attractive, well-filled nut both in and out of the shell. There is, however, a slight tendency to bitterness, but this is characteristic of some almonds and does not detract from their quality. A soft-shell type.

Riverside Peerless: Though the quality of this variety is rather variable, it is sometimes very good. More attention to detailed pruning of laterals appears to improve the quality. Crops are good. This variety should also be associated with Chellaston for pollination. It is a soft-shell variety.

Later Flowering

Hatch's Nonpareil: The nuts are of good quality, sweet, uniform, and attractive with only a small amount of doubles, which are undesirable. It is a so-called paper-shell variety and easy to open. Though not a heavy cropper, it is considered one of the best-quality varieties.

Strout: Though the nuts are not very attractive in the shell, the kernels are of good quality and plump. Cropping is fair to good, but the tree is not as easy to manage as most others because of its spreading growth. This variety, however, is of value as a pollinator for Hatch's Nonpareil.

Other Varieties

Other varieties worth trying are Ne Plus Ultra, I.X.L., White Nonpareil, Texas Prolific, Burbank Seedling, Johnston's Prolific, and Monavale.

Soil Preparation and Planting

The soil should be well and deeply cultivated in readiness for planting.

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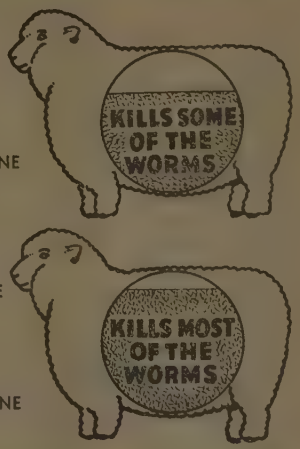

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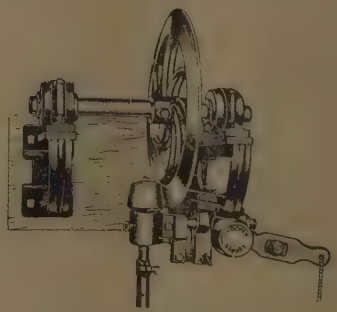

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As almonds have a very short period of dormancy, early planting, preferably in late autumn, is advisable to allow them to become well established before new season's growth begins.

Almonds vary considerably in their mode of growth, some being spreading and others rather upright. As it is important to mix varieties to assure satisfactory pollination, the distance between trees must be controlled by the widest spreading varieties. To allow sufficient room for the spreading varieties to develop and crop properly the trees should be spaced preferably about 25ft. apart both ways and certainly not less than 20ft.

Cultural Aspects

Almonds require almost the same treatment as peaches and nectarines. They respond to careful attention and will not crop well if neglected. Generally, clean cultivation should be practised from early spring to about the end of January. Cover crops should then be sown or other means, such as mulching, taken to assure the maintenance of soil organic material. The addition of nitrogenous fertilisers is also important and annual applications should be made of 6lb. to 8lb. per mature tree. About 3lb. to 4lb. should preferably be applied in early spring and a similar amount 2 weeks before the last swelling of the fruit (about the end of December or early January). Superphosphate is best applied at the time of sowing the cover crop, 2cwt. to 3cwt. per acre being broadcast over the whole area.

During dry summers periodic irrigation of almonds will assure that fruits and nuts develop properly, prevent foliage and fruit dropping, and build up the fruiting laterals and buds for the next season.

Almonds fruit on yearling laterals and on spurs produced on older wood, the extent of the latter depending on the variety. Pruning is therefore designed to assure sufficient old fruiting wood being removed so that it can be replaced by strong young lateral growths. If consequent young growths are excessive, the surplus should be thinned out, sufficient being retained for good cropping.

On large, mature trees detailed pruning every year would probably be uneconomic and in practice is seldom attempted, but some thinning of new growths and cutting out of old wood must be done periodically to maintain trees in good condition and to assure sound crops. The spreading habit of some varieties will sometimes need controlling by the shortening of fruiting arms or lateral growth, as otherwise the planting will become overgrown and light to the trees will be restricted.

Harvesting

Almonds growing under good conditions and receiving proper treatment should begin to produce light crops in the third or fourth year. By the time they are 8 to 10 years old they should be in full production. To facilitate harvesting a light canvas sheet should be spread on the ground beneath each tree. This is done when most of the hulls (or dried flesh) have opened and before the nuts begin to fall. The nuts are made to fall by giving the branches a severe shaking or jarring. It may also be necessary to remove some of the more persistent nuts by knocking them off with a large stick or rubber hose attached to a pole, care being taken not to damage the tree.

Good crop of almonds grown at Bay View, Hawke's Bay.

What is known as hulling or cleaning the nuts of any remaining dried skin requires attention directly after harvesting. Before this can be done some further drying in the sun may be necessary, but over-exposure to sun should be avoided, as the shells are apt to be made too dark to be really attractive. The hard-shelled nuts are sometimes bleached by sulphur fumes, but this is unwise with damaged nuts or soft-shelled types.

Production

Insufficient almonds are grown in New Zealand to enable a reliable assessment of possible crops. However, in Australia and America crops of 700lb. to 1000lb. of nuts per acre in the shell are common, though sometimes under good conditions crops are even heavier. The weight of kernels varies according to variety, but usually is about 45 per cent. of the weight of nuts in the shell.

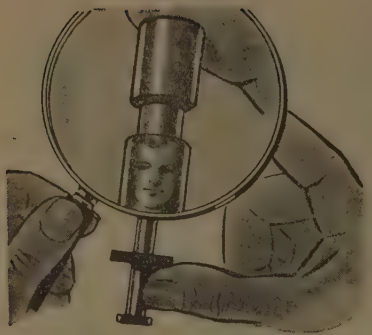
Diseases and Pests

Almonds are apt to be affected with the same diseases and pests common among peaches. Therefore, if well-known disease control measures for peaches are used, little trouble should be experienced. Leaf curl (*Taphrina deformans*), silver leaf (*Stereum purpureum*), and leaf rust (*Puccinia pruni-spinosae*) are likely to be the worst fungous problems and green peach aphis (*Myzus persicae*), leaf roller caterpillar (*Tortrix* sp.), and San Jose scale (*Quadraspidiotus perniciosus*) the main insect problems.

Detailed advice on the control of insect pests and diseases can be obtained from the nearest horticultural officer of the Department of Agriculture.

HAZEL NUTS

Though the species *Corylus* is generally referred to as the hazel nut in New Zealand, the species has various



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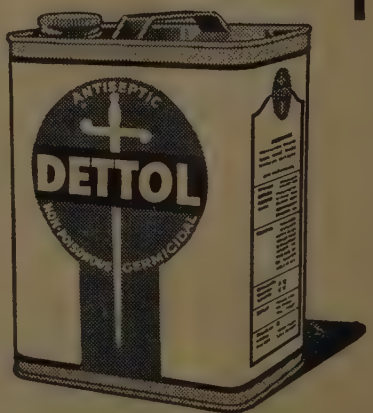

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Row of 4-year-old almond trees of mixed varieties growing at Bay View, Hawke's Bay.

synonyms such as filbert, Barcelona, or cobnut. Actually these are selected or improved forms of the wild hazels which occur in nearly all parts of Europe and western Asia. The most important are *C. avellana*, native of almost the whole of Europe, and *C. maxima*, native of south-eastern Europe and western Asia. *C. avellana* is probably the parent of the cobnut, which is short and rather round and not completely covered by a husk.

It is also thought that the filbert originated from *C. maxima*. The filbert nut is longer and completely covered by a husk. However, many hybrids have been developed over a long period and the length of the husk or the shape of the nut has largely lost its significance. The name Barcelona applied to these nuts appears to have arisen from the fact that they are produced extensively in Spain.

Soil and Climate

Hazel nuts prefer a reasonably cool climate, if possible without late frosts. Ample shelter from strong winds is also advisable and the planting position should have a northerly aspect.

The soil should be moderately fertile. Rich soils may induce excessive growth at the expense of fruiting. Good drainage is essential, but ample moisture must be available to the trees during summer. Light soils in low summer rainfall areas would be unsuitable.

Though bearing will begin in 7 to 8 years, the trees may take 12 to 15 years to reach full bearing. However, they have a long life (between 60 and 100 years).

Varieties

The most widely grown and popular variety in England is Kentish Cob (or more correctly Lambert's Filbert). It is thin shelled, has a very good flavour, and is considered to be the best general-purpose variety. In America it is known as Du Chilly.

Other good varieties are Cosford Cob, which also crops well, and Pearson's Prolific, Atlas, Hemples, and Tonollo.

It is advisable to select a main variety, such as Kentish Cob, and interplant with another good pollinating variety capable of carrying plenty of catkins. Pearson's Prolific is a good one for this purpose, as well as for its own value as a producer.

Propagation

As hazel nuts cannot be grown true to variety from kernels, they must be propagated vegetatively, that is, from rooted suckers or by layering. If small branches are layered in autumn, they will have rooted sufficiently by the following autumn to be transplanted to nursery rows and grown on to develop into suitable young trees for permanent planting. Rooted suckers can also be transplanted to nursery rows in the same way.

The propagation of trees by grafting desired varieties on to vigorous seedlings may be advisable or more practical.

Soil Preparation and Planting

The soil should be well and deeply cultivated in readiness for planting. The best time to plant is in late autumn, but late winter planting can also be done if soil conditions are suitable.

Plantings can be arranged as hedges or on the square as for fruit trees. Trees planted on the square should be about 15ft. apart each way; if planted as hedges, they should be about 6ft. to 8ft. apart.

Cultural Aspects

For good results some periodic attention must be given to pruning. With bearing trees this should be delayed until the male flowers have completed the shedding of their pollen in spring, as otherwise many of the catkins are removed before the female flowers are pollinated.

Pruning given in the early years of establishment should be fairly hard, the aim being to develop an open-centred tree of medium height with abundant lateral growth. The nuts are borne on 2-year and older spurs on these laterals. As the tree develops further the surplus and heavier laterals should be thinned out and the finer ones retained. Strong side shoots and leader shoots should be shortened back to maintain good tree shape and size. All sucker growth must be removed. The main object should be to cut away sufficient of the older and worn-out parts to assure ample new twiggy fruiting wood.

As far as possible clean cultivation should be practised and the soil humus maintained with mulches or cover crops. The addition of a mixed fertiliser each spring is desirable. Some soils may also benefit by occasional liming.

Harvesting

Harvesting can be done by hand picking as the husks dry off and the nuts become fully mature, or the trees can be shaken or the branches struck with a pole to cause the nuts to fall on to a ground sheet. They should then be picked up and dried for a short time in the sun or in an airy shed. They should then be picked over and any remaining husks should be removed.

Diseases and Pests

Hazel nuts are fairly hardy and are seldom seriously affected with diseases and pests. Some protection may be necessary against leaf-roller caterpillar and weevils, but occasional DDT or DDD sprays should be all that is required.

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Lily of the Valley Tree

THE beautiful lily of the valley tree *(Clethra arborea)* is a native of Madeira Island in the Atlantic Ocean, where it grows wild at 2000ft. to 5000ft. above sea level.

[*Elliott*

It is a handsome evergreen tree of rather upright habit growing to a height of about 25ft. The leaves are dark shining green and from 3in. to 6in. long and up to 2in. wide. The flowers, which usually appear from February on, are about ⅜in. in diameter, pure white, and fragrant. They are borne in clustered terminal panicles and resemble the flowers of the lily of the valley so closely that the tree is named after them and is justly famous for the beauty and loveliness of its flowers. The flowers are often used and prized by florists for floral sprays, etc.

A reasonably well-sheltered position that is open to the sun is best for this tree. It is an advantage, however, if the roots can be shaded. It is fairly hardy and should grow anywhere in New Zealand where winters are not severe.

Being a member of the heath family, it prefers an acid or neutral soil and on no account should lime be used near the plant.

Propagation: If seed is obtainable, it may be sown during August and September thinly in boxes of the following soil mixture:—

2 parts of good loam (sterilised if possible)

1 part of peat or leafmould

1 part of river sand

All parts are by volume. To each bushel of the mixture ¾oz. of carbonate of lime and 1½oz. of superphosphate should be added.

The seed should be lightly covered with a dusting of finely sifted peat. When the seed-bed is being watered it should be covered with 2 layers of scrim and a fine rose used. The bed should be kept shaded until germination takes place, as the seed strike is inclined to be variable.

When the seedlings are large enough they may be potted up separately in the same soil mixture as that recommended for seed sowing, but with the addition of 1½oz. of blood and bone or hoof and horn fertiliser to each bushel of the mixture.

During December and January cuttings of half-ripened side shoots, taken with a heel, may be inserted in a pot containing a compost of 3 parts of coarse river sand and 1 part of peat or well-rotted leafmould. After insertion of the cuttings, the surface should be coated with a thin layer of sharp river sand. An upturned glass jar should be placed over the cuttings in the pot, which should then be well shaded and watered on the outside. If medium bottom heat can be provided, this will assist rooting, which should take place in a month or so. The cuttings may then be treated as for seedlings. If it is not desired to undertake propagation, excellent, well-grown plants may be obtained from many general nurserymen and should be delivered for planting in May or September, but not midwinter.

—*F. E. WILKIN, Plant Quarantine Officer,*
Department of Agriculture, Invercargill

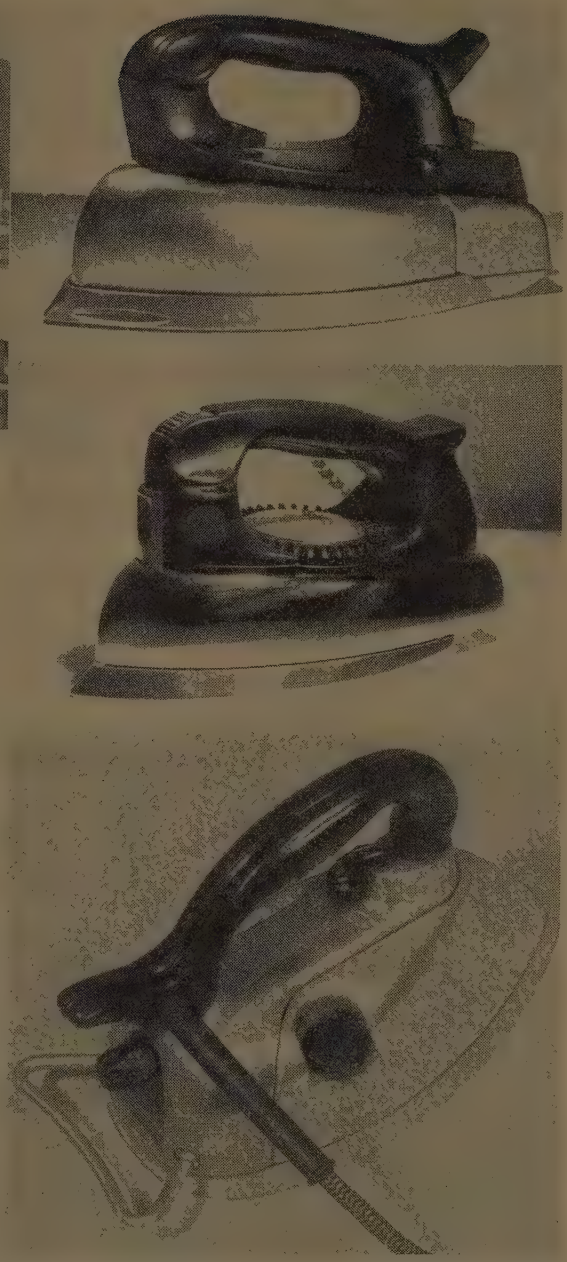
By MAUD B. STRAIN,

Field Officer in Rural Sociology, Department of Agriculture, Dunedin

ANY home-maker considering the purchase of a new iron will want to know whether she should buy the long-used, conventional electric iron or whether it might be to her advantage to invest in one of the latest-type combination steam-and-dry irons. The good results obtained with steam irons and presses by tailors and dry cleaners have long been evident, but the domestic counterpart—the combination steam-and-dry iron—is a comparative newcomer on the market. The somewhat extravagant claims brought forward with the first models have not been entirely substantiated, but new improved models recently produced are worth investigating before a final decision is made. This article discusses some points in the choice and use of this type of iron.

WHEN clothes are ironed heat alone does not remove wrinkles; a partnership of heat and moisture is needed. Sprinkling clothes with water and ironing them with a hot iron has been the procedure hitherto, and it has been generally satisfactory, but if the sprinkling, folding, and letting stand until the garment was uniformly damp could be dispensed with, much time could be saved. The combination steam iron attempts to do this.

Steam is a convenient form in which to introduce moisture into the material of a garment; water causes spotting with some fabrics. When steam is generated in the cloth and simultaneously smoothed over with a hot iron wrinkles are removed; if the cloth becomes too warm, steam will not condense in it and the ironing will not be satisfactory. The hotter the iron becomes above the point necessary to convert water into steam the less effective will it be, because it will make the steam hotter and drier. Since it is the moisture in the steam that removes the wrinkles, it follows that the heat of the iron should be held at a temperature only sufficiently above the boiling point of water to make sure that all the water is converted into steam.



Upper—A steam iron of the kettle type in which all the water in the container boils.

Middle—A flash-boiler iron in which the water is turned to steam drop by drop.

Lower—This iron, one of the first steam irons on the New Zealand market, was one of the kettle type.

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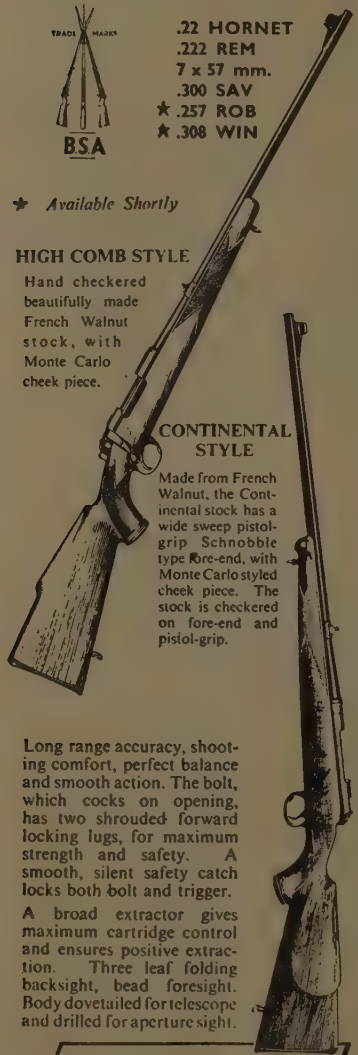

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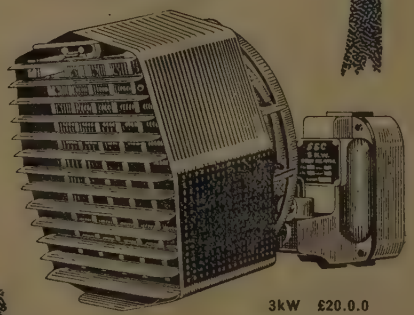

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The dial of one of the latest steam irons. The heat of the iron is controlled by setting the dial according to the fabric to be ironed.

A good iron should have a sensitive thermostat, one that will detect and react to a slight variation in temperature. Some materials require more moisture than others. The dial setting of an iron should be so adjusted that the amount of steam issuing into the cloth is the correct amount for that particular type of cloth. The automatic control should be such that the temperature of the sole plate stays the same whether little or much steam is being used. An iron functioning properly should give the right combination of heat and steam to relax the fibres of the various fabrics and smooth them out, or to set pleats and knife-edged creases where they are desired.

Types of Irons

All available domestic steam irons belong to one of two classes—the kettle type or the flash-boiler type. The kettle type is essentially a vessel containing water and mounted over a heated sole plate; water is heated inside this vessel by the electric current until it boils and steams. The steam issues from openings located at the point, around the edge of the sole, or near the centre of the sole from which it is spread over the surface by a series of radiating channels.

The flash-boiler type has a reservoir, either separate from the iron or contained within the iron itself, arranged so that water from it drops on a hot plate which converts it instantly into steam. The flash-boiler type that produces steam instantly within the iron itself gives instant steam or instant dry ironing merely by the turning of a knob or the pressing of a switch. The switch moves a plunger which closes the valve through which water must drop to reach the sole plate, so that when the switch is in the "off" position no water can get through to be converted into steam. As an extra precaution some irons are so constructed that when they are stood on the heel water cannot drip through even if the switch is still "on".

It is claimed for the kettle type that though it takes longer for the water to boil and steaming to begin, the steam is generated at a more constant rate. There is, however, an inherent hazard in boiling a volume of water within a confined space, and there is a real hazard in emptying the boiling water from some of these irons when the work is done. To prevent pressure building up within the iron in the event of the steam channels becoming blocked these irons are provided with a safety valve. The location of this is important. It should be so placed that if it comes into action, the user is not likely to be burnt. To stop a kettle iron from steaming it must be emptied. This means that to convert from steam to dry ironing the reservoir must be emptied and, conversely, to change from dry to steam ironing the reservoir must be filled and the water brought to boiling point. The capacity of the cavity varies in different irons from 1 to 2 cups of water; if there is a large ironing, the iron will need refilling several times.

Some of these irons are emptied by holding them point downward over a sink, thus allowing the steam and hot water to spurt out through the holes in the sole plate; this could be hazardous if done carelessly. Others are emptied through the holes used for filling the iron, but even here care is required to remove the plug and empty the iron without scalding the hand.

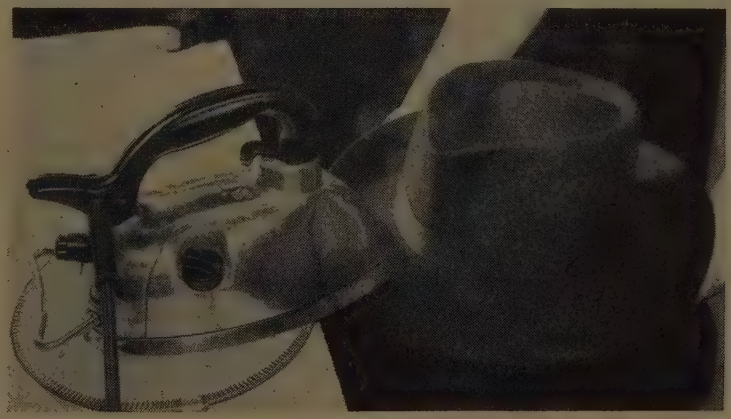
Choosing an Iron

A good steam iron should have a reliable thermostat, one that reacts to small changes in temperature. Otherwise the sole plate temperature may fall so low that all the water delivered through the sole plate may not be converted into steam, or rise so high that the steam might not condense in the cloth.

The newer irons are lighter in weight but higher in wattage and depend on the combination of heat and steam rather than weight to produce the desired result.

The temperature selector should be easy to adjust and give accurate heat control. The dial should be easy to read and, for accurate dry ironing, marked for individual fabrics. The ease with which the iron can be filled with water is important, also the rapidity with which it can be converted from steam to dry and back again.

Controls and other parts likely to be touched by the operator should not become too hot.



The correct way to steam a felt hat.

STEAM IRONS . . .

The weight is important, as there is less fatigue in using a light-weight iron. Steaming time, that is the time during which steam issues in a usable amount, should be considered. It varies, according to make of the iron, from 12 minutes to ¾ hour on one filling. The water capacity governs the steaming time, and the capacity varies from 6oz. to 16oz.

It is a wise precaution to buy a product backed by a well-known brand and made by a reliable manufacturer.

Hard and Soft Water

Soft water only should be used in a steam iron. A good rule is to use distilled water in a hard-water area and also when in doubt. Hard water contains dissolved mineral matter which when the water is boiled is deposited on the inside surfaces of the water cavity and forms a hard coating similar to the "fur" in a tea-kettle. This, in time, will plug up the vents and prevent the free escape of steam. Rain-water, distilled water, and the defrostings from a refrigerator are all mineral free and therefore safe to use.

If any deposit has formed inside the cavity, the following treatment will be helpful: Fill the reservoir with vinegar or de-scaling fluid, allow the vinegar to boil for 15 minutes, then leave the iron to stand overnight. In the morning the vinegar should be poured out and the cavity thoroughly rinsed with water.

Care of Irons

Irons of any kind should be cared for according to the manufacturer's directions. There are, however, several suggestions that apply irrespective of make:—

Dropping should be avoided, because it is more harmful to irons than any other hazard.

The connecting cord should be replaced at the first sign of wear, and the appliance attachment plugs should be kept in good condition.

The sole plate should be clean when used; if it is soiled, it should be wiped off when cool with a dry cloth or rubbed with a mild scouring powder. Water should never be allowed to seep into the part housing the electric element.

Always unplug the iron from the wall socket when filling or refilling it.

When storing the iron it is important to remember to empty the reservoir completely while the iron is hot. Water in a cold iron may seep out and discolour the sole plate. Leave the tank plug out of the kettle-type iron while it is not in use, because if it is left in, it is sometimes difficult to unscrew.

Different sole plate designs adopted by various manufacturers for distributing the steam generated within the irons.

How to Use a Steam Iron

Practically all light-weight fabrics can be ironed with a steam iron except those starched with vegetable starch. These and heavy cottons and all linens require damping and a dry iron.

Even light-weight cottons should be taken from the line and ironed before they are thoroughly dry. The amount of steam produced is not always sufficient to remove completely all creases and wrinkles from bone-dry fabrics.

Rayons: Some of these require more moisture than can be supplied by a steam iron. However, if they are taken from the line before they are quite dry, the dampness left in them could provide the necessary extra moisture.

Acetate, especially acetate jersey, is better when pressed with a steam iron.

Nylon, "Terylene" (polyester fibre thread or yarn), and "Orlon": A steam iron is ideal for smoothing out the wrinkles in these fabrics.

Shiny, closely woven, hard-surfaced fabrics with a natural shine should be ironed with a press cloth because the shine will be increased by any abrasion no matter how slight.

Rough-textured fabrics do not show shine, so they can be ironed without a press cloth, but care should be taken not to iron directly over double-thicknesses of material such as seams, because seam outlines will mark the fabrics and once these marks have been made they cannot be removed.

A good rule is to steam iron everything except cottons and linens on the wrong side and to touch up pockets, lapels, and collars on the right side, using a piece of muslin as a protection against shine.

Velvet garments should be steamed with a steam iron, not steam ironed. This is done by holding the steam iron ½in. above the pile side of the fabric and letting the steam penetrate it thoroughly. While the area being steamed is still damp it should be brushed gently with a semi-stiff brush. Brushing should always be done with the "lie" of the pile. Thin wale corduroy can be steam ironed on the right side of the fabric and then brushed to raise the pile. Heavy corduroy should be treated like velvet.

Thick woollens such as are used for coats also respond well to steaming by this method. Heavy-lined coats, which are difficult to press any other way, can be rejuvenated similarly.

All garments, whether steam ironed or just steamed, should be hung on hangers and allowed to dry thoroughly before they are worn or stored.

After a garment has been steam ironed on the wrong side and turned to the right side before being hung up to dry it should be gently laid on the ironing table and the steam iron held ½in. above it. The iron should be directed back and forth above the entire garment until the garment has been completely enveloped in steam. The garment is then hung up to dry.

Good grooming demands perfection of detail. Accessories need attention as much as does the rest of the wardrobe, and here the steam iron is of great help.

Hats, gloves, scarves, and shoes of suede, felt, velvet, or velour, veilings, sweaters, and feathers can all be rejuvenated and refreshed with steam from a steam iron, and a good iron produces just enough steam to revitalise these accessories. For gloves and shoes and similar articles the procedure is as follows: Place the iron, resting on an asbestos mat so that it will not scorch the ironing cloth, so that the point where the steam issues overhangs the ironing table. The article is held in the steam and turned slowly until the entire surface has been steamed. It should then be brushed with a soft clothes brush or rubber sponge in the direction of the nap or pile. To steam hats begin at the top of the crown and brush with the nap in circles down to the brim. The inside and outside of the brim should also be steamed and brushed with the pile.

When the iron is used as a dry iron difficulty is sometimes had with the finer, more slippery fabrics and with embroidered work, as the grooves in the bottom of the iron catch and pucker these fabrics.

Advantages to Home User

When a garment is being made steam pressing each seam as it is done, and the garment during different stages of construction, gives a professional look and facilitates a good fit.

With a steam iron woollens can be shrunk, and cottons shrunk and evened up, stitches embedded, seams smoothed, sleeves shaped, sharp creases pressed in, and excess fullness shrunk out when a hem is turned up. All this can also be done with a dry iron and pressing cloths, but not nearly as conveniently or as satisfactorily, because controlled steam is required and only a good steam iron provides this.

STEAM IRONS

A coat collar being steam pressed on the wrong side before being touched up on the right side. When the right side of such material is being pressed it is advisable to iron over a piece of muslin as a protection against shine.

According to opinions of users and retailers the earlier steam irons were not wholly successful. Users admitted that the irons had their limitations, but within those limits performed excellently, though they required a little more concentration by the operator than did the conventional electric irons. Retailers spoke of various complaints. Before the necessity for using soft water was understood there was some difficulty with irons blocking up with "fur" and not functioning properly, either as steam irons or dry irons.

Those with a separate water container for attachment when required were cumbersome and inconvenient. A variation using a dry iron with a superimposed sole plate and an attached reservoir for water and with no heating element of its own, but drawing its heat from the sole plate of the dry iron, required such a high temperature that it was unsatisfactory. The arrangement was clumsy and the temperature of the dry iron needed to be about 600 degrees F. to heat the superimposed sole plate sufficiently to make steam, and when the steam attachment was removed there was a long wait while the iron cooled down sufficiently to be used on anything but the heaviest and dampest of linen or cotton articles.

Research has continued and newer irons incorporate many improvements in design and performance. Users stress the ease with which clothes can be pressed and freshened with these irons, also their time-saving capabilities with most of the household ironing.

Some of the new irons have earned the recommendation of an overseas institution which jealously guards its awards and does not bestow them unless the appliance has proved by the excellence of its performance that the award is merited.

Mint Chutney is Easily Made and Keeps Well

THROUGHOUT spring, summer, and autumn mint may be seen growing profusely along the edges of small creeks and streams. Its uses for mint sauce and as a garnish are well known, but much more of it could be used in making chutney. Mint chutney is easily made, keeps well, and its flavour is piquant and appetising.

1½ pints of vinegar
½lb. of ripe tomatoes
1 teaspoon of salt
1lb. of apples
1lb. of onions
5oz. of raisins
1lb. of sugar
4 tablespoons of chopped mint
2 teaspoons of dry mustard

Heat the vinegar to boiling point, boil it for 1 to 2 minutes, and set it aside to cool. Cut up the tomatoes and sprinkle the salt over them. Peel the onions. Peel and core the apples. Put the apples, onions, and raisins through a mincer. Mix together the sugar, dry mustard, and chopped mint and add the minced ingredients. Lastly, stir in the vinegar and mix the ingredients thoroughly. Pour the chutney into sterilised jars and cover and store the jars. After the chutney has matured for 2 to 3 weeks it is ready for use.

—*MAUD B. STRAIN,*
Field Officer in Rural Sociology, Department of Agriculture, Dunedin

Growing Chrysanthemums Outdoors

AFTER the brightness of summer flowers the garden can still be enriched by the brilliant colour of chrysanthemums. They flower from February to July and without them the home and garden would be very dull in autumn and early winter. In this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes their cultivation in the open. The notes for garden work in May are by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch.

CHRYSANTHEMUMS are one of the oldest flowers cultivated. For centuries they have been important flowers in China and Japan; nowadays they are grown in nearly every country of the world and the forms of the flowers are in every shade except blue.

In New Zealand they are usually cultivated in the open, except for some of the late-flowering or large-flowered types grown for exhibition. In most countries in the Northern Hemisphere greenhouse culture is standard practice, and the New Zealand gardener can thank the mildness of the climate for saving him the extra work entailed in glasshouse culture.

It is only natural that a plant which has been grown for so many years should have produced many sports and many different shapes in the flowers, and standards for each different type have been laid down by chrysanthemum societies.

In many gardens chrysanthemums are looked on as ordinary herbaceous perennials and are allowed to grow and flower without special attention. The true beauty of any variety will not be obtained this way, and many other plants will give an equal or better display.

Cultivated carefully even in a mixed or herbaceous border, these apparently ordinary plants give surprisingly fine blooms, and though they may not always be up to exhibition standard, they will brighten the garden and provide plenty of good flowers for decorative work.

The important features of chrysanthemum growing are:—

1. Propagation
2. Choice of site and soil preparation
3. Seasonal cultivation
4. Pest and disease control

Propagation

When chrysanthemums have finished flowering in late autumn or early winter the old stems should be cut down to the base. Where a range of varieties is grown it is necessary to keep only two or three clumps of each variety. These should be lifted and set in a sheltered part of the garden; soil should be worked among the roots and firmed so that the stools can root again. This is more satisfactory than leaving them in the old flowering area, where they may get choked with weeds or where other plants may be disturbed if they are not lifted until spring.

If they are to be replanted in the same place, early lifting is essential, as soil preparation should be carried out by early spring at the latest.

It may seem hard to discard many otherwise good stools, but it is better to do this than retain too many or leave the clumps undivided for several seasons. When left undisturbed they soon revert to insignificant, daisy-like flowers with none of the beauty of well-cultivated individual plants.

Division

In September the stools which have been bedded down will be throwing good, strong shoots; the stools should be lifted carefully with a fork and the side shoots detached with a few roots. All old stems and weak side shoots attached to them should be discarded. The selected plantlets should be set in a nursery bed of well-prepared soil, or in their final position if this has already been prepared. These young plants should not be hard or woody at the bases.

HEADING PHOTOGRAPH: Types of chrysanthemum. Left—Large exhibition, Pockett's Maroon. Right—Anemone, K. G. Castles.

At this time precautions should be taken against pests and diseases. Chrysanthemum leaf eelworm and chrysanthemum gall midge can both be controlled more readily on young plants than later in the season.

Cuttings

An objection to raising plants from stools by division is that the young plants have a long growing season and tend to grow excessively tall through the summer months. Most nurserymen and specialists prefer to raise new plants from unrooted cuttings, as a greater number of plants can be raised by this method and they do not grow so tall.

Cuttings can be struck easily by using the tips of the young growths, a shoot about 3in. long being taken. The lower end is cut through cleanly at the base of a pair of leaves and the lower leaves removed.

The soil mixture should consist of equal parts of loam (preferably sterilised), coarse sand, and organic matter such as peat or leafmould. This should be placed in seed boxes or a shaded frame, should be moist and well firmed, and some sand should be sprinkled over the surface. A hole should be dibbled with a rounded stick such as a short length of bamboo or a wooden skewer and the cutting inserted. The soil should then be firmed round the base and the whole area given a good watering.

Seed boxes if used should be placed in a greenhouse or frame and a layer of newspaper placed over the plants. Occasional watering should be given and any dead leaves removed. The paper over the plants may be removed in 10 to 14 days and if the plants are in a frame, slight ventilation should be given. The plants should be rooted and ready to plant out into a reserve bed in 3 to 4 weeks, and set out in their final position by early November. In the warmer parts of the North Island cuttings may be struck outside if they are protected from sun and wind.

GROWING CHRYSANTHEMUMS OUTDOORS

Chrysanthemum clumps or stools in a box of soil to produce cuttings.

Choice of Site

In many gardens it will be difficult to choose the ideal site, which should be open and sunny and yet protected from the wind. Wind protection is especially important, as the plants grow tall, and in an exposed position satisfactory temporary shelter can be grown by sowing maize in 4 rows on the windy side of the plot.

Soil Preparation

As chrysanthemums are fibrous-rooted plants, they make a great demand on plant nutrients and water present in the surface soil. It is important that this is well manured with organic matter such as a compost or well-decayed animal manure dug in during winter. A dressing of lime at 2oz. to the square yard should be applied subsequently and a mixture of the following fertilisers applied as the soil is being worked down for the final planting:—

Blood and bone, 4 parts by weight
Superphosphate, 2 parts by weight
Sulphate of potash, 1 part by weight
(at 4oz. to the square yard)

Planting out

The young plants in the nursery bed or cutting box should be ready for setting out towards the end of October; if the weather is dry, they should be watered the evening before lifting and again when planted out. A trowel should be used for this operation and a reasonable quantity of plants can be carried in a seed tray without any risk of the roots drying out. The soil in the final position should be firm at planting time.

The distance apart at which plants should be set varies considerably, depending on the final method of cultivation, staking, and use. If they are set in a mixed or herbaceous border, 18in. apart is satisfactory. If grown separately, they can be planted in rows 12in. apart in the row and with 2½ft. between rows. Even at this stage a stake will be needed to support the young plants. A watering with a weak solution of soluble foliar fertiliser will help plants grow away quickly.

Left—Single chrysanthemum, Lady Sargood. Right—Korean chrysanthemums. Elliott photo.

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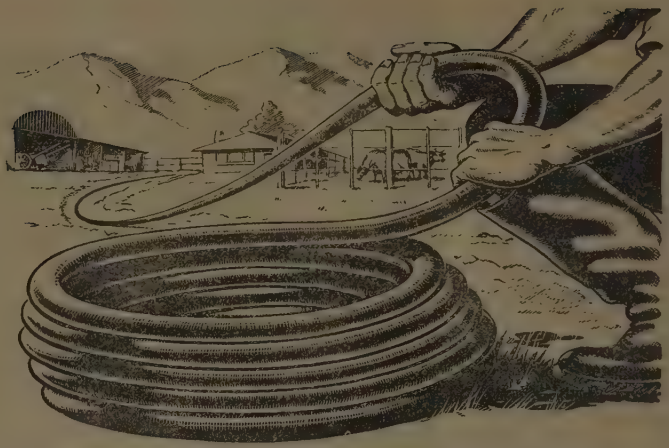

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Plants received from nurserymen may not arrive until mid-November; these plants are raised from cuttings and nurserymen sometimes find difficulty in having sufficient plants of all varieties ready at one time. Little harm will come if the plants are set out at this time, provided they are well watered and shaded from really hot sun or drying winds. As soon as the plants have settled in, the growing points should be pinched out to encourage the side buds to grow out.

Stopping

Overseas literature lists times and dates for stopping each variety to obtain flowers by a certain date. Exact dates do not need to be followed in New Zealand, except for exhibition plants. These dates would vary for the same variety, depending on the location, and specialist exhibitors would need to obtain local advice on this aspect.

Stopping is not a very technical operation, but is simply removing the growing point of a plant or shoot.

Once the young plants are established the growing point is gently removed between the thumb and finger (see A in the illustration on page 403). If the plants are more than 8in. high, about 2in. of the tip should be removed. As a result several side shoots grow out and about five of these are retained evenly spaced round the plant.

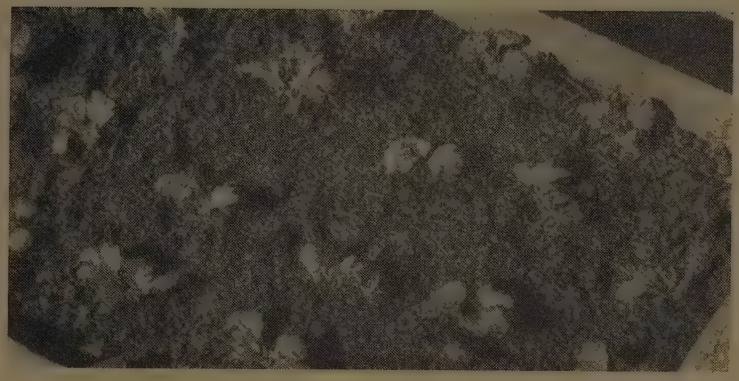
As soon as these side shoots are about 6in. long the growing points are again pinched out. This is called "stopping the first breaks" (see B in the illustration on page 403). The date of this operation varies with the variety and location. For very early flowers from early flowering varieties this second stop is unnecessary, but for flowers in autumn on all varieties stopping should be carried out in the first 3 weeks of December, commencing with the early flowering varieties. Pompon varieties are stopped in the usual manner but not disbudded.

Disbudding

As a result of the earlier stopping many side shoots will have developed. For general garden decoration a maximum of 20 should be retained; for exhibition these are often reduced to three.

At the top of each shoot on early varieties a cluster of buds will be seen by early February. All buds except the central one should be carefully removed by rubbing out with the thumb. The central bud left is known as the crown bud (see C in the illustration on page 403). Side shoots also should be removed for 12in. below this bud.

If the crown bud is accidentally damaged, a side bud or shoot from lower down can be allowed to grow, "run on", and this can be treated as a crown bud and similarly disbudded (see D in the illustration on page 403).



Sturdy young tip cuttings removed from stool and set in a box to root.

Crown buds on autumn-flowering varieties are selected or "secured" during February and early March, and disbudding must be carried out regularly every 3 or 4 days as the buds develop over a period on any one plant.

Sometimes disbudding is called "taking the bud", but "securing" is a more accurate term.

Routine Attention

Staking is extremely important and well-branched plants grown individually will require 3 stakes about 4ft. long inserted round the plant. A third of the shoots is tied to each stake with soft twine.

Where the plants are grown in rows the best method is to set up a stout

Propagation by division. Young shoots already rooted detached from the parent plant. The bases of these cuttings should be soft and succulent, not hard and woody. These cuttings normally grow taller than tip cuttings.

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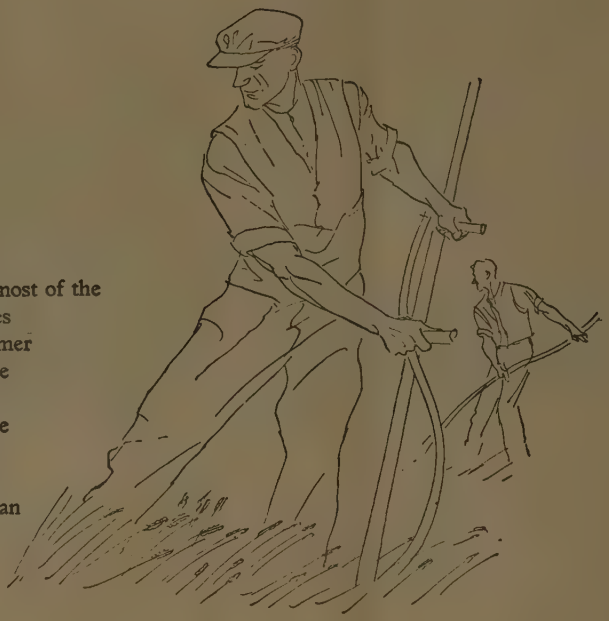

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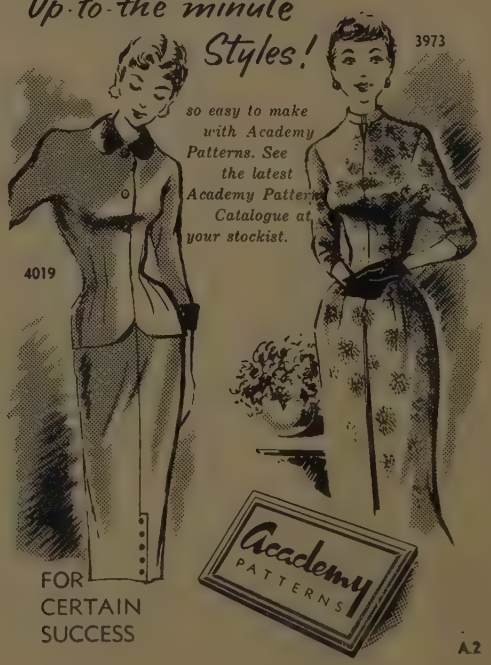


FOR CERTAIN SUCCESS

A.2

stake at each end of the row with a crosspiece 15in. wide nailed on to it. Galvanised wire (14 gauge) is then stretched along either side of the row and a cross-tie of string tied on either side of each plant. Occasional crosspieces of wood should be fitted between the wires to prevent them from crushing the plants. With tall varieties a second pair of wires should be fitted up in March.

Watering

Regular watering will be required in dry weather and a really thorough application should be given. In addition a side dressing of mixed fertiliser should be hoed in when the ground is moist, and the following mixture will produce high-quality blooms:—

Sulphate of ammonia
2 parts by weight
Superphosphate 2 parts by weight
Sulphate of potash
1 part by weight
(at 2oz. to the square yard)

The soil can then be lightly mulched with old compost, wilted lawn mowings, or any other old organic matter. The side dressing may be repeated if growth is slow, but should not be applied after the buds show colour.

Routine Pest and Disease Control

Unfortunately chrysanthemums are susceptible to various pests and diseases and spraying is necessary to keep them healthy.

The most damaging diseases are mildew and rust, partially controlled by spraying with a fungicide based on sulphur, thiram, or ferbam.

The commonest pests are eelworm, midge, aphis, and caterpillar. The last two can be controlled during the growing season.

A suitable combined fungicide and insecticide mixture would consist of:—

Lindane emulsion (20 per cent. material)	½ fl. oz.
Thiram	1¼oz.
Water	4 gallons
or	
DDT emulsion	1 fl. oz.
Lime sulphur	3½ fl. oz.
Colloidal sulphur	1½oz.
Water	4 gallons

These should be applied at 3-weekly intervals from planting out time until flowering. A fresh mixture should be made up each time, as the material may spoil or react to cause plant damage if left for more than a day.

Cutting the Flowers

Unlike many other flowers chrysanthemums do not normally develop to their full size if cut in the bud stage. The flowers should be left on the plant until the outer petals have grown to their full length, but the centre petals should still be folded over the heart of the flower. Cutting is best done with secateurs or a sharp knife, the stems all kept one way, and either held in the hand with the heads hanging downwards or resting over the edge of the flower basket. If flowers are placed one on top of the other with the lowest ones resting on a hard surface, the petals are bruised or break.

When flowers are brought in from the garden the lower leaves should be stripped off and the bases of the stems slightly crushed or split upwards with a knife or secateurs. The stems should then be placed upright in a deep container of water for several hours before the flowers are used for decorative arrangements.

Later in the season many of the side shoots flower in clusters or sprays. It is not worth disbudding these sprays and a complete cluster should be cut and placed in water; afterwards either the whole spray or small individual flowers can be used.

A well-grown, correctly staked, mature plant. A—Position of first stop, carried out soon after setting in final position; two shoots developed. B—Position of second stop, carried out in late December; five shoots retained. C—Disbudded side shoot flowering on the crown bud. D—Two side buds were secured instead of the crown bud; these were disbudded.

End of Season

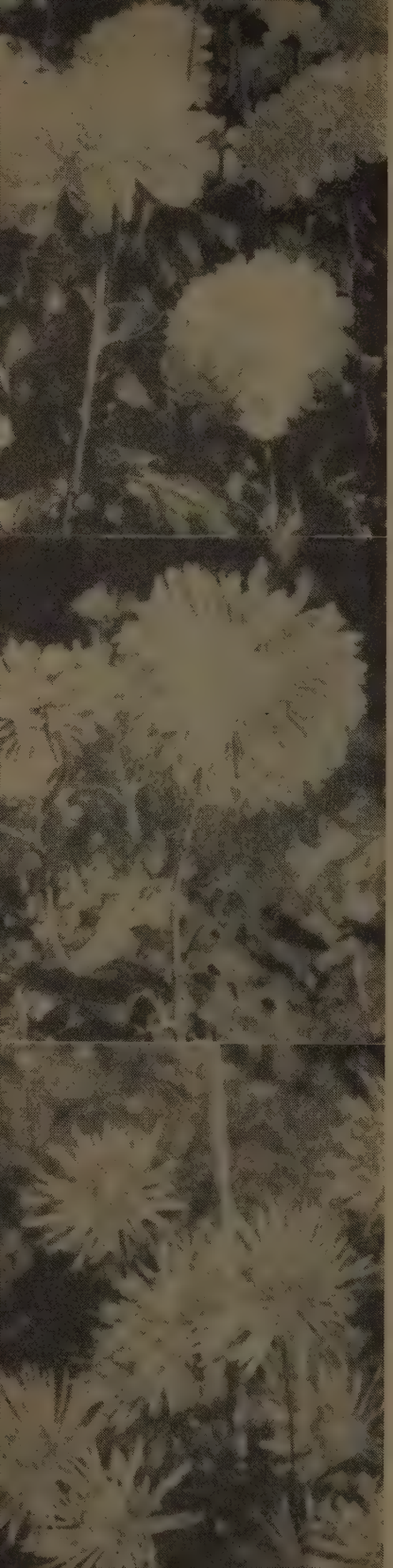
When the last flowers have faded the strings holding the old stems should be cut, the supporting wires and stakes removed, and the stems cut back to 6in. from the ground. All fallen leaves should be burnt, and the cycle starts again with the lifting of stools to provide fresh plants for the following season.

Classification

In a catalogue the classification may appear rather confusing, but an understanding of the differences is essential if a good selection of varieties for shape, colour, and time of flowering is to be chosen. In New Zealand the classification of the National Chrysanthemum Society of Great Britain is followed with a slight modification for climatic conditions. The basis of the New Zealand classification is:—

1. **Time of Flowering**
   (a) Early.
   (b) Mid season.
   (c) Late.

Early flowering chrysanthemums were previously known as summer



flowering chrysanthemums in New Zealand. They are now defined as a variety that blooms in a normal season in the open ground before 1 April without any protection whatsoever.

2. **Size of bloom**
   (a) Large.
   (b) Medium.
   (c) Small.

3. **Shape of Flower and Position of Petals**
   (a) Incurved: tight globular head, petals evenly arranged, curving towards centre.
   (b) Incurving: More loosely packed globular head, petals evenly curving towards centre.
   (c) Reflex: Globular head, but petals curving outwards.

4. **Type of Flower**
   Exhibition: A large bloom with breadth and depth of equal proportions.
   Decorative: Blooms which are fully double, but are flat and not as deep as they are broad.
   Anemone: Varieties with a central cushion of small florets and outer rings of strap-like petals.
   Pompon: Small double blooms in clusters or sprays.
   Singles: Blooms have not more than 5 rows of strap or ray petals; centre is not like a cushion as with anemone centred.
   Fantasy: Petals loosely arranged, twisted, and curled.
   Hirsutes: Petals loosely arranged, but ends of petals cut and frilled.
   Cascade: A small flowered type of single chrysanthemum which by cultivation can be trained to grow downwards.

Note: The following terms have now been superseded:—

Summer flowering is now early flowering.

Japanese or Chinese is now large exhibition or large exhibition incurving.

Identification of Troubles

Unfortunately chrysanthemums are attacked by a range of pests and diseases, but in New Zealand many of the troubles reported elsewhere are not present. It is seldom possible to grow good chrysanthemums without the application of some pest control materials and prompt recognition of the trouble and routine application of the correct material will control all troubles except virus diseases.

Stems and Leaves

Chrysanthemum Gall Midge

Symptoms: Raised cone-shaped galls on the leaves and stems, especially near the growing tips, throughout the growing season. Small maggots may be present in the galls. This trouble is especially severe in some North Island districts. Old stools and young cuttings should be carefully examined at propagating time and control measures taken immediately and repeated during the growing season.

Control: If only a few plants are affected, destroy them. Dip or spray stools and young cuttings with lindane emulsion at ½ fl. oz. (20 per cent. material) to 4 gallons water and spray through growing season with this or DDT emulsion at 1 fl. oz. plus nicotine sulphate at 1 fl. oz. to 4 gallons of water. Parathion is also effective (see section under eelworm).

Chrysanthemum Leaf Eelworm

Symptoms: Leaves show purple or brown, dead areas between the veins of the leaves, older leaves fall, and lower part of the stem becomes bare.

Control: If only a few plants are affected, destroy them. Other measures are:—

1. Old stools after being lifted may be dipped in hot water at 120 degrees to 125 degrees F. for 5 minutes. The soil should be washed off the stools and these dipped in small quantities in the warm water bath. The temperature of the water must be maintained at 120 degrees F. After removal of the stools from the bath wash them in cold water and plant in clean soil to produce cuttings.

2. Water or dip stools and young, rooted cuttings with poisonous organic phosphorus insecticides such as parathion or schradan. Water again twice at fortnightly intervals. These materials also control aphis and gall midge.

When these materials are used the following precautions should be taken:—

Wear protective clothing consisting of overalls, rubber boots, and rubber gloves.

Handle all materials and containers carefully and water the solution on the plants; do not spray it on. Do not let it fall on the skin or reach the eyes.

Do not smoke when applying the solution and wash all clothing, utensils, and oneself immediately after using these materials.

Store the concentrated material carefully under lock and key and destroy or bury empty containers. The plants may be safely handled 7 days after the application.

Set out treated plants on ground which has not grown chrysanthemums before and burn all stools once the cuttings have been taken.

Leaf Miner

Symptoms: Small, brown tunnels in the leaves; occasionally a small maggot is found at the end of the tunnel.

← Types of chrysanthemums. Upper—Early flowering reflexed, Balcombe Yellow. Middle—Single, Desert Song. Lower—Fantasy straight, Golden Bendigo.

Control: Routine sprays of lindane emulsion at ½ fl. oz. (20 per cent. material) to 4 gallons of water.

Leaf Roller and Other Caterpillars

Symptoms: Leaves tied together and margins eaten.

Control: Hand picking and squeezing in small infestations. Spray with DDT emulsion (20 per cent. material) at 1½ fl. oz. to 4 gallons of water.

Chrysanthemum Rust

Symptoms: Brown pustules on undersides of leaves; occasionally followed by dropping of older leaves.

Control: Spray during growing season, especially from mid-January onwards, with thiram at 1½oz. to 4 gallons of water (can be mixed with lindane or DDT emulsions) or lime sulphur 3½ fl. oz. plus colloidal sulphur at 1½oz. to 4 gallons of water. (Do **not** mix with lindane emulsion.)

Powdery Mildew

Symptoms: Whitish powdery mould over both leaf surfaces.

Control: Dust plants regularly with sulphur dust or spray with lime sulphur at 3½ fl. oz. plus colloidal sulphur at 1½oz. to 4 gallons of water. (Do **not** mix with lindane emulsion).

Septoria Leaf Spot

Symptoms: Brown, dry spots, not pustules, on surface of leaves about ⅛in. in diameter. Tiny black dots visible on the spots.

Control: Spray with copper oxychloride at 3oz. to 4 gallons of water. (Do **not** mix with lindane emulsion.) Try thiram at 1½oz. to 4 gallons of water.

Spotted Wilt Virus

Symptoms: Dead, rusty, circular areas or round, yellow areas on leaves, brown streaks on stem.

Control: No control; prevent infection. This disease occurs on many plants and is spread by thrips. Control these by spraying with DDT emulsion at 1 fl. oz. (20 per cent. material) to 4 gallons of water. Lift and burn infected plants.

Verticillium Wilt

Symptoms: Plant wilts and dies.

Control: Check that soil is moist but not too wet and that there are no grubs such as grass-grubs at the roots. Examine inside of stems near bases of plants. If they are stained mauve-brown, this is verticillium wilt. Lift and burn infected plants. Do not grow chrysanthemums where tomatoes and stone fruit trees have died, as these are susceptible to verticillium wilt and may have infected the soil.

An old clump severely infested with eelworm. The lower leaves have fallen and stems are hard and woody.

Flowers

Aphis Infection

Symptoms: Clusters of black or green insects round buds and growing points.

Control: Make sure parent stools are clean by treatment with hot water, spraying with insecticide such as lindane emulsion at ½ fl. oz. (20 per cent. material) to 4 gallons of water or lindane wettable powder at 1oz. (16 per cent. material) to 4 gallons of water. The organic phosphorus materials when used for eelworm control are also effective. Also spray or dust growing plants with lindane materials, or DDT emulsion at 1 fl. oz. to 4 gallons of water.

Chrysanthemum Gall Midge

Symptoms: Raised cone-shaped galls beneath flower buds.

Control: See under leaves and stems.

Spotted Wilt Virus

Symptoms: Flowers are small and distorted, often with dead patches.

Control: See under "Stems and Leaves".

Acknowledgment

Thanks are due to Plant Diseases Division, Department of Scientific and Industrial Research, for checking the information in the pests and diseases section.

Flower Garden in May

In May a definite change of seasons can be noticed in the flower garden. Most of the herbaceous plants will have finished flowering as will many bedding plants, and deciduous trees and shrubs will have lost much of their foliage by the end of the month.

Frost must be expected in the colder districts and any tender plants growing in open positions should be adequately protected. A good method is to erect a tripod of macrocarpa branches or similar material over the plant. Such an arrangement will give a fair protection against frost, but will also admit air and light to the plant so that it will not be softened unduly.

Herbaceous Border

Autumn is the busiest and most important period in the herbaceous border. Very few plants have top growth in winter and during this month most plants can be cut back. An inch or two of the old stalks should be left so that the plants can

readily be seen while work is going on in the border. Any plant material which has been removed and is found to be infected with pests and diseases should be burnt. but the rest can be placed on the compost heap, where it will break down to valuable material for the garden. The bases of the plants should be cleared of weeds and debris.

Any plants growing in unsuitable positions should be transplanted and any clumps of plants that have grown too large should be broken up. Though this work can be done throughout winter, it is mostly desirable to do it in autumn while the border is being overhauled.

The best portions for replanting are the succulent shoots which have developed on the outside of the clumps; these should be chosen in preference to the hard and woody growth near the centre. Plants which cannot be divided by hand should be separated with two forks placed back to back.

Some herbaceous perennials develop long, fleshy roots; most of these should not be transplanted or divided, except when they become too crowded. In this group are lythrum, Oriental poppy, peony, and platycodon.

Delphiniums should not be divided until spring. Moisture may accumulate in the bases of their hollow stalks and when the plants have been split up in autumn rot may develop and destroy the plants. They are best handled as soon as the new shoots have developed in spring.

Preparation of positions for replanting should be done by deep digging and working in of well-rotted manure or compost, but these materials should be kept away from the roots when planting is carried out.

When the border has been cleaned up it should be dug and the annual dressing of organic matter, such as animal manure or compost, applied. In northern districts it is probably best to make the application before digging and turn it in; in cold districts it can be left as a mulch during winter and turned in during spring. Some protection against frost will then be given to the plants during winter.

Dahlias

Dahlias will have been cut by frost in most districts and elsewhere they will be spent. They should now be cut down, but not too close to the ground, so that they can be handled by the remaining stalks. The tubers can be left in the ground until spring in all but the coldest districts provided drainage is good. If lifted, they should be stored in cool conditions where they are not subject to drying winds.

Dahlias should always be marked with their names at lifting time. If this marking is done by labels, these are best tied on to a sound root, as a stalk with a label may be knocked off during storage. The names can also be written on the tubers with an indelible pencil, after which they can be read a year or more later.

Lawns

Newly sown lawns will soon be ready for their first mowing. A few days before this is done a light rolling should be given to consolidate the soil round the roots and also to prevent lumps of soil from being caught by the mower. This is especially important where no rolling has been carried out after sowing.

The mower should be sharp and well oiled to assure a clean cut without pull on the grasses or dragging by the wheels. It should be set fairly high for the first few cuttings; in fact. a close mowing of a new lawn should not be made until spring growth starts.

Planting Trees and Shrubs

"What is planted in autumn must grow; what is planted in spring may grow" is an old saying which applies very much to New Zealand climatic conditions. If planted in autumn, the plants will get the benefit of the greater rainfall and if planted early enough before the soil temperature cools down, root movement will begin immediately on most evergreens and even on some deciduous plants.

Furthermore, the soil will consolidate round the roots and consequently not dry out as readily as is the case when planting is done in spring. A few evergreens, such as rhododendron, and frost tender subjects should be planted in spring, but otherwise it is best to plant trees and shrubs during late autumn and early winter.

Once a tree or shrub has been planted nothing further can be done to improve the soil below it and thorough preparation of the site is therefore well worth while. Incorporation of well-decayed organic matter will improve the soil texture and assist the supply of moisture to the new roots during dry weather.

The hole should always be made large enough to accommodate all the roots when they are spread out. Examination of the plant will generally reveal the depth at which it was growing and it should be planted at the same level or an inch or two deeper. Any broken or damaged roots should be cut off cleanly and the remainder spread out.

Evergreen plants are generally sent out from nurseries with scrim packed round the roots. This should be removed and if the soil appears very clayey, it is best to remove it carefully and spread the roots out.

The soil should be packed firmly round the roots by tramping, but without damage to the plant. If the soil is dry, watering should be carried out and staking done immediately if necessary.

Cuttings

Many evergreen shrubs and hedge plants can be propagated by cuttings in late autumn. Some of them may be very slow in rooting, in which case it is best to leave them in the cutting bed for a whole year before moving them. This should be taken into consideration when choosing a site for the nursery bed. Apart from adequate drainage for the winter care should be taken that the bed does not become too hot in summer. A fairly light soil is preferable; if it is at all heavy, sharp sand should be incorporated to open it up.

The best cuttings are generally made from vigorous-growing side shoots. They may be from 4in. to 8in. long according to type of plant; cuttings with a heel generally root more readily. To take cuttings with a heel suitable shoots of the correct length are pulled off with a downward movement. Some of the older wood will then be pulled off with the shoot and in preparation of the cuttings a small portion of this is left on the base. The prepared cuttings should be inserted firmly in the soil to a depth of 2in. to 4in. respectively.

Evergreen plants which can be raised by cuttings now include escallonia, euonymus, garrya, lavender, lonicera, veronica, and many conifers.

Empty Plots

The flower garden tends to be neglected in regard to applications of organic matter, but to get the most from any soil such applications should be made whenever possible.

Many plots, especially in southern gardens, will be empty during winter. Where this is the case these beds can be given a good dressing of manure or compost, or if this is not available, dead organic material can be used. When the ground is dug over the material is mixed in with the soil; it will rot down and leave the bed in better condition for planting next spring.

Applications of Lime

In many home gardens it is the practice to give a dressing of lime every year, usually in autumn or winter.

Some plants, notably boronia, kalmia, rhododendron, and most ericas, will not tolerate free lime in the soil, but many plants in the flower garden prefer a neutral soil. Heavy applications of lime can seldom be recommended, but where organic matter has been applied generously and the plants are known not to be "lime haters" an annual dressing of carbonate of lime at 1oz. to 2oz. per square yard may be applied.

Lime should never be applied indiscriminately in the flower garden.

Appetising Dishes from Offal Meats

By DAPHNE EILERS,
Field Officer in Rural Sociology, Department of Agriculture, Auckland

THE good housewife is perpetually seeking variety in meals for her family while still giving them a balanced diet. Sometimes the organ meats or offal are discarded or are always served in the same manner. Full use should be made of the organ meats, first because they are valuable sources of mineral salts, vitamins, and protein, and second because of the many appetising dishes which can be made from them. Organs from home-killed meats should always be examined carefully for disease before use.

THE most valuable and probably the most popular of these meats are kidneys, liver, heart, and brains, and recipes for making appetising dishes out of these are given here.

Kidneys

Mutton, lamb, beef, veal, or pork kidneys are all equally suitable for use in the following recipes, but the relative size of the kidneys must be considered when others are substituted for those mentioned in the recipe. Kidneys should always be skinned and soaked in salted water before they are cooked. The skin comes off more readily if the kidneys are placed in a little cold water first.

Lamb kidneys are frequently served fried or grilled. For cooking in this way they are skinned and cut in halves, and the cores and tubes are removed. The kidneys are then sauted in butter or bacon fat. For grilling they are best pierced by a skewer to hold them flat and brushed with melted butter before they are placed under the grill.

Kidney Stew

3 beef kidneys
3 tablespoons of butter
¼ cup of flour
2 cups of water
2 teaspoons of minced onion
¾ teaspoon of salt
¼ teaspoon of pepper
3 cups of hot boiled rice

(6 servings)

Cut the kidneys in halves and remove the cores and skins before cutting the kidneys into sections. Place the kidneys in a bowl with water to cover and 1 teaspoon of salt and leave them to soak for an hour. Melt the butter in a pan and saute the drained kidneys until they are browned (about 5 minutes). Add the flour and cook for 1 minute; then add the water, onion, pepper, and salt and simmer the kidneys with a lid on the container for 15 minutes. Serve the kidneys on the hot rice at once.

As a variation to this recipe 3 tablespoons of red currant jelly may be added and ½ cup of red wine substituted for ½ cup of water. One and a half teaspoons of horse radish (grated) or prepared horse radish sauce and 1½ tablespoons of lemon juice will also give an interesting flavour variation.

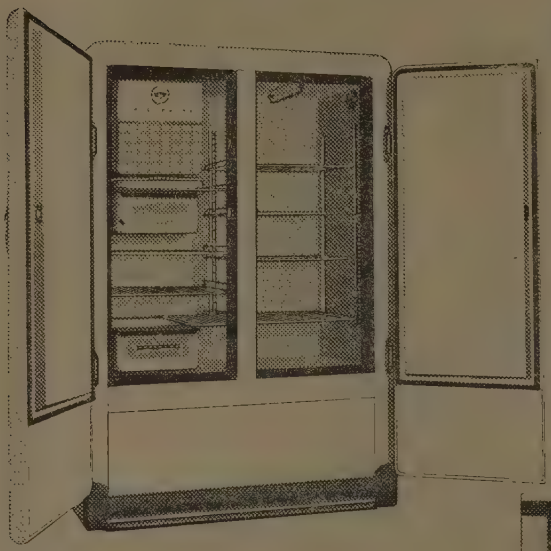
HEADING PHOTOGRAPH: Preparation of baked kidneys.

Baked Kidneys

9 lambs' kidneys
1 egg
1 tablespoon of water
½ teaspoon of finely chopped onion
¼ teaspoon of salt
¼ teaspoon of mace
Fine fresh bread-crumbs
2 tablespoons of butter

(6 servings)

Wash and skin the kidneys, cut them in halves crosswise and remove the cores, and place them in salted water to soak for ½ hour. Drain and dry the kidneys and dip them into the slightly beaten egg mixed with the water and seasoning. Roll the kidneys



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in the breadcrumbs and place them in a greased oven dish. Pour the butter (melted) over the kidneys and bake them uncovered at 450 degrees F. for about 20 minutes. They should be served at once. Longer cooking will toughen them.

Kidney and Mushrooms on Toast

4 sheeps' kidneys
4oz. of mushrooms
2oz. of butter
Salt and pepper to taste
1 teaspoon of flour
1 teaspoon of lemon juice
1 egg

(4 servings)

Wash the mushrooms, peel them, and cut them into slices. Melt the butter and cook the mushrooms in it until they are tender. Wash and skin the kidneys and chop or mince them finely. Place them in a saucepan with salt and pepper and sufficient water just to cover them. Simmer them gently until they are tender. Add the mushrooms to the stewed kidney. Add the flour mixed to a paste with a little water and then add the lemon juice and the egg well beaten. Stir the mixture over gentle heat for a few minutes and then pile it on hot buttered toast.

Steak with Kidney Stuffing (a variation of beef olives)

1lb. of stewing steak
Parsley
1 sprig of thyme
1 tablespoon of soft breadcrumbs
Salt and pepper
4oz. of beef kidney (washed and skinned)
1oz. of butter
2 or 3 mushrooms (if desired)
½ pint of stock
Yolk of 1 egg
1 rasher of bacon
Little flour for thickening

(4 servings)

Stuffing: Mince the kidney, parsley, and thyme, season these with salt and pepper, and combine the mixture with the breadcrumbs. Add the beaten egg yolk to this and mix well. If mushrooms are used, they should be peeled, sliced, and sauted in a little butter and then added to the stuffing mixture.

Steak: The steak should be cut into thin strips and each strip spread with the kidney stuffing before being rolled and fastened with a skewer. Place the bacon in a saucepan and put the stuffed meat rolls on top; cook them for a few minutes until the steak is browned. Pour the stock over the meat and cover and simmer the dish until the steak is tender. Thicken the gravy with flour mixed with the butter and serve.

Liver

Lambs' and calves' livers are suitable for frying, stewing, and braising; ox liver is suitable for stewing and braising. Liver should be wiped with a damp cloth and then dipped into boiling water to aid in the removal of the skin.

Baked Liver and Apple

1lb. of liver
2 large sour apples
1 medium-sized onion
½ teaspoon of salt
A little pepper
6 rashers of bacon
½ cup of water

(4 servings)

Devilled liver is a very nutritious dish.

Wipe the liver, remove the skin, and cut the liver into thin slices and place these in a casserole. Chop the apples and the onion finely and place them on the liver. Sprinkle the pepper and salt over the mixture before putting the chopped bacon on top. Pour in the ½ cup of water. Bake the liver covered in a moderate oven (350 degrees F.) for 1½ hours. The lid may be removed for the last 20 minutes of baking to brown the bacon.

Savoury Liver

1½lb. of liver
¼ cup of chopped onion
2 teaspoons of chopped parsley
2 tablespoons of butter
2 tablespoons of flour
¾ teaspoon of salt
Dash of pepper
3 tablespoons of vinegar
2½ cups of stock

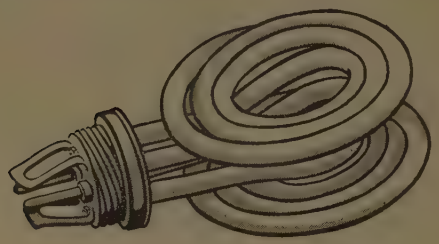
(6 servings)

Wipe and skin the liver and slice it thinly. Saute the onion and parsley in the melted butter until the onion is lightly browned, and stir in the flour, seasoning, and vinegar. Add the stock gradually to the mixture, stirring all the time. When the ingredients are thoroughly mixed place the liver in the gravy and cook it covered for about 15 minutes.

Devilled Liver

1½lb. of liver
1 tablespoon of flour
1 tablespoon of mushroom ketchup
1 teaspoon of lemon juice
2 medium tomatoes
3oz. of butter or lard
1½ cups of water
1 teaspoon of Worcestershire sauce
1 small onion or a clove of garlic
2 hard-boiled eggs

(6 servings)



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2 tablespoons **Edmonds** Cornflour, 2 breakfast cups milk, 1 tablespoon butter, ¾-1 cup brown sugar, 2 egg whites, 1 teaspoon Vanilla Essence.

Mix cornflour to a smooth cream with a little of the milk. Melt the butter in a saucepan, add the sugar and stir over a low heat until the sugar dissolves. Heat the remainder of the milk and **gradually** stir it into the sugar and butter. Add the cornflour and stir over a low heat (or put in a double saucepan) and cook 10-15 minutes. Cool a little, then add the stiffly beaten egg whites and vanilla. Serve in individual dishes topped with whipped cream, nuts and cherries.

ICE CREAM

1 pint milk, 1 breakfast cup sugar, 2 teaspoons **Edmonds** Custard Powder, 2 teaspoons flour, 1 tin unsweetened Condensed Milk.

Place tin of milk in boiling water. Boil 5 minutes, chill. Heat milk in a saucepan leaving out sufficient to mix flour, custard powder and sugar to a smooth paste. Pour hot milk on to this and cook in a double boiler until it thickens. Cool. Beat condensed milk till fluffy and add to the custard mixture. Beat well. When half frozen remove from tray, place in a bowl and beat well. Return to refrigerator to freeze.

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The stages in the preparation of brain fritters. The skinned brain is pressed under weights before it is coated with egg and breadcrumbs and fried.

Wash, skin, and slice the liver and fry it in the melted butter for 6 to 8 minutes. Remove the liver to a hot dish. Saute the sliced onion or garlic and sliced tomatoes in the hot butter. When the onion is browned add the flour and stir the mixture well. Add the water and cook the gravy until it is thickened, stirring it all the time. Add to the gravy the Worcestershire sauce, ketchup, lemon juice, and finally the hard-boiled eggs (roughly chopped). Pour the gravy over the hot liver and serve it at once.

Heart

Beef, calf, lamb, or pork hearts are suitable for use in the recipes below. Before being cooked they should be washed in several waters and left to soak in cold water for an hour. Any blood vessels still left on the heart should be removed.

Stuffed Heart or Mock Duck (4 servings)

1. Bread Stuffing

3 cups of soft breadcrumbs
½ teaspoon of salt
⅛ teaspoon of pepper
¼ teaspoon of thyme
½ medium onion (chopped finely)
¼ cup of butter (melted)

Mix the breadcrumbs, seasonings, and onion and add to them the melted butter. Mix these with a fork until they are well blended.

2. Dried Fruit Stuffing

1 cup of dried prunes
1 cup of dried apricots
Salt to taste

Soak the apricots and prunes overnight. Remove the stones from the prunes. Mix the fruit and salt together.

3. Vegetable Stuffing

1 medium onion (finely chopped)
¼ cup of chopped celery
2 tablespoons of bacon fat
1 teaspoon of salt
¼ teaspoon of sage
2 tablespoons of chopped green pepper (if desired)
1 cup of soft breadcrumbs
¼ teaspoon of paprika
¼ teaspoon of thyme
1 carrot (grated)

Cook the onion, celery, and green pepper in the hot bacon fat until they are softened. Remove the pan from the heat and add the rest of the ingredients to the vegetables. Mix together thoroughly.

Each of the above stuffing recipes is sufficient for two calves' hearts or one beef heart.

After washing the hearts fill the cavities with the stuffing mixture and sew and tie them securely. Roll the hearts in seasoned flour and sear them in hot fat until they are browned. Place the hearts in a baking dish; rinse out the pan in which they were seared with some boiling water and pour the water into the baking dish. Add more boiling water to half cover the hearts. Cover the dish and bake the hearts in a moderate oven for 2 hours or until they are tender. The liquid remaining when the hearts are cooked should be thickened and served with the meat. If desired, mushrooms may be added to the liquid during the last 20 minutes of cooking. They give additional flavour to the gravy.

Brains

Calf and lamb brains are most often used, but pork and beef brains are also quite suitable. One set of small brains is sufficient for one serving. Brains should be soaked in cold water for 15 to 20 minutes. The skin and fibres should then be removed. The brains are then simmered for 20 minutes in salted water to which a tablespoon of vinegar or lemon juice has been added. The brains should then be drained and cooled in cold water (this makes them firm). They are then ready for use in any of the following recipes.

Fried Brains

The brains should be prepared as described and after cooling and draining they should be rolled in seasoned flour and fried in hot fat or butter for

15 minutes or until they are brown. They may be served with bacon or with a highly seasoned sauce.

Scrambled Brains

4 sets of lambs' brains or 2 sets of calves' brains or 1 set of beef brains
4 hard-boiled eggs (chopped)
1 teaspoon of salt
1½ tablespoons of Worcestershire sauce
¼ teaspoon of pepper
¼ cup of butter
2 eggs (slightly beaten)

(6 servings)

Cut the prepared brains into small pieces and add them to the melted butter in a frying pan. Add the chopped hard-boiled eggs to the brains and then pour in the beaten eggs mixed with the seasonings. Cook the mixture gently, stirring it a little to scramble it. Serve the brains on hot buttered toast.

Brain Fritters

4 sets of brains
Salt and pepper to taste
4 tablespoons of butter
2 eggs (slightly beaten)
4 tablespoons of cold water
Dried breadcrumbs

(4 servings)

Press the prepared brains between two plates to give them a firm shape. Mix the slightly beaten eggs with the cold water and coat the brains with the mixture before dusting them with the breadcrumbs. Fry the brains in the hot butter until they are golden brown. Serve them with the tomato sauce described below.

Tomato Sauce

1 cup of tomato juice
2 tablespoons of butter
2 tablespoons of flour
½ teaspoon of salt

Melt the butter and add the flour and salt, stirring the mixture until it bubbles. Remove it from the heat and add some of the tomato juice, stirring the mixture until it is smooth. Return it to the heat and add the rest of the juice gradually, stirring the sauce all the time. When the sauce has thickened continue to cook it for 1 to 2 minutes. A more piquant sauce can be made by the addition of 1 teaspoon of Worcestershire sauce.

Devilled Brains

3 sets of brains
A pinch of cayenne pepper
Salt and pepper
1 cup of tomato sauce (prepared as above)

(3 servings)

Cut the prepared brains into small pieces and add them with the seasonings to the tomato sauce. Heat the mixture and serve it on hot buttered toast.

All photographs by Sparrow.

A Novel and Useful Apron

By ELIZABETH LAURENSON,
formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland

THERE are many occasions when the housewife is called away from some task and hurriedly wipes her hands on the front of her apron. The illustration shows an apron which is both useful and attractive and which combines the functions of apron and hand towel. It can be made very simply from 1yd. of 36in. cotton material and a small towel.

BEFORE the apron is cut the end of the material should be straightened by pulling a thread. The material can then be cut according to the diagram at the bottom of this page.

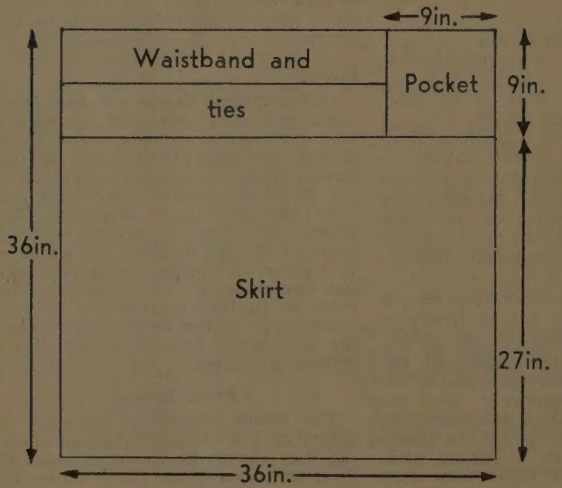
Making the Apron

A narrow hem is turned in and machined on each side of the skirt. The two pieces for the waistband and ties are joined to make one strip.

If the hand towel is large enough, one end may be cut off and used as trimming for the pocket. The raw edges of the pocket are then turned in and the pocket is tacked and machined into position.

The strip of material used for the waistband and the ties should have the raw edges turned in and should then be folded in half so that the turned-in edges just meet. The towel is placed on the skirt so that the edge of the towel and the edge of the skirt coincide. The top of the skirt is then gathered together with the towel and these are inserted in the waistband so that the centre of the skirt and the centre of the waistband meet. The ties should be of even length. One row of stitching from the end of one tie to the end of the other tie will hold the turned-in edges together and will enclose the raw edges of the skirt and the towel. The bottom of the skirt is turned up the required amount and hemmed.

Two yards of ric-rac braid were used for trimming the apron illustrated. The braid was attached with embroidery thread in a contrasting colour. This is a simple but effective trimming, and the apron can be made to look most attractive by choosing gay cotton material and a hand towel in a matching or contrasting colour.



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